Baltimore and Ohio Railroad Co.

SIGNAL STANDARDS

Return to
GENERAL ENGINEERING DEPT.
5 File R.R. Stds

No.

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NAME	EMPLOYED AS

Who Hereby Agrees to Return it to the Proper Officer when Called for, or upon Leaving the Service.

AUTOMATIC TRAIN STOP

A25-5A	DUMMY INDUCTOR
S-109	INDUCTOR LAYOUT WITH MATERIAL LIST
S-181	TRACK INDUCTOR GAUGE

BATTERY BOXES

S-366	CONCRETE BATTERY BOX (ASSEMBLIES)
S-367	" " " (DETAILS)
S-368	" " " "
S-369	" " " "

BOLTS

S-154	ANCHOR BOLTS
S-421	BOLTS FOR CROSSING SIGNS (FOR 4 AND 5 INCH PIPE)
S-386	COTTERS (SIZE-DRILLING-LOCATION)
S-500	3/8" GALV. CARRIAGE BOLT 4" OR 4½" LONG
S-501	5/8" GALV. CROSSARM BOLT SQ. HEAD AND SQUARE NUT (8" to 24" BY 2" STEPS)
S-502	5/8" GALV. DOUBLE ARMING BOLT WITH 4 SQ. NUTS (14" TO 24" BY 2" STEPS)
S-311	GROUND MAST SIGNAL ANCHOR BOLT
S-448	HIGHWAY CROSSING SIGNAL CANTILEVER MAST ANCHOR BOLT
S-154	NUTS AND BOLTS
S-312	PIPE BRACKET POST ANCHOR BOLT
S-124	PRECAST FOUNDATION ANCHOR BOLT

DERAILS

S-135	LAYOUT FOR SPLIT SWITCH DERAIL
S-213	SWIVEL TYPE FRONT ROD FOR SWITCH POINT DERAIL

DRAGGING EQUIPMENT DETECTOR

S-134	DRAGGING EQUIPMENT DETECTOR LAYOUT WITH MATERIAL LIST

ELECTRIC LAMPS

S-113	ELECTRIC LAMPS USED BY SIGNAL DEPARTMENT
S-110	" LIGHTED SWITCH LAMP WITH MATERIAL LIST

FOUNDATIONS

S-356	CONCRETE FOUNDATION FOR COMPENSATOR
S-124	HIGHWAY CROSSING SIGNAL FOUNDATIONS
S-124	FOUNDATION FOR GROUND MAST SIGNALS
S-311	" " " " "
S-448	HIGHWAY CROSSING SIGNAL FOUNDATION (CANTILEVER MAST)
S-355	CONCRETE FOUNDATION FOR HORIZONTAL CRANK STAND
S-312	" " " PIPE BRACKET POST
S-124	PRECAST CONCRETE FOUNDATIONS FOR INSTRUMENT CASES

GROUND RODS

S-148	SECTIONAL GROUND RODS & FITTINGS
S-172	SPECIAL GROUND ROD ARRANGEMENTS

INSTRUCTIONS

ARRESTERS -

I-119	INSTRUCTIONS FOR LIGHTNING ARRESTERS
I-117	INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS

BATTERIES -

I-113	INSTRUCTIONS FOR CAUSTIC SODA BATTERIES COPPER OXIDE TYPE
I-112	INSTRUCTIONS FOR LEAD TYPE STORAGE BATTERY SEALED GLASS JAR FLOATING CHARGE
I-111	INSTRUCTIONS FOR NICKEL-IRON ALKALINE STORAGE BATTERY
I-118	LEAD STORAGE BATTERY USAGE TABLE

BONDS -

I-122	INSTRUCTIONS FOR INSTALLING CADWELD SIGNAL BONDS

GREASE AND OILS -

I-135	GREASE & OILS USED BY SIGNAL DEPARTMENT

GROUNDS -

I-117	INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS

INSPECTIONS & FIELD TESTS -

I-109	INSTRUCTIONS FOR ELECTRIC LOCKS APPLIED TO INTERLOCKING
I-123	GENERAL INSTRUCTIONS FOR SIGNAL INSPECTORS
I-120	SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS & INSPECTIONS
I-133	INSTRUCTIONS FOR THE MAINTENANCE AND TESTING OF C.T.C. SYSTEM - U.S.& S. CO. CIRCUIT CODE SCHEME
I-127	INSTRUCTIONS FOR TESTING INSULATION RESISTANCE OF SIGNAL CIRCUITS
I-110	INSTRUCTIONS FOR TESTING MECHANICAL INTERLOCKING
I-138	INSTRUCTIONS FOR TESTING AUTOMATIC TRAIN CONTROL INDUCTORS

INSTRUCTIONS (Cont.)

INTERLOCKING -

I-129	INSTRUCTIONS FOR THE MAINTENANCE & REPAIR OF INTERLOCKING

PAINTING -

I-134	INSTRUCTIONS FOR PAINTING SIGNAL & INTERLOCKING APPARATUS

RECTIFIERS -

I-126	USAGE TABLE FOR BATTERY CHARGING RECTIFIERS

RELAYS -

I-105	INSTRUCTIONS FOR TRACTIVE ARMATURE DIRECT CURRENT RELAYS & D.C. RELAY REQUIREMENTS FOR TYPE "K" RELAYS
I-106	DIRECT CURRENT RELAY REQUIREMENTS FOR TYPE "B" RELAYS

RESISTORS -

I-116	USAGE TABLE & ORDERING REFERENCES FOR RESISTORS USED BY SIGNAL DEPARTMENT

RULES -

I-136	"I.C.C.RULES, STANDARDS & INSTRUCTIONS,EFFECTIVE OCTOBER 1,1950"
I-137	B.& O. RULES, STANDARDS & INSTRUCTIONS

SEALING COMPOUNDS -

I-102	SEALING COMPOUNDS USED BY SIGNAL DEPARTMENT

SWITCHES -

I-110	INSTRUCTIONS FOR SWITCH CIRCUIT CONTROLLERS

INSTRUCTIONS (Cont.)

TRACK CIRCUITS -

I-101	INSTRUCTIONS FOR MAINTENANCE AND ADJUSTMENT OF CONVENTIONAL NON-CODED D.C. TRACK CIRCUIT

WIRES AND CABLES -

I-100	INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
I-125	INSTRUCTIONS FOR SUSPENSION STRAND AND AERIAL CABLE
I-130	INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
I-131	WIRING INSTRUCTIONS
I-132	INSTRUCTIONS FOR HANDLING WIRE & CABLE

INSULATION

S-214	SWITCH ROD INSULATION
S-215	INSULATION FOR NO. 3607 FRONT ROD

LENSES AND ROUNDELS

S-193	LENSES AND ROUNDELS USED BY SIGNAL DEPARTMENT

INTERLOCKING

25-3A	REMINDER TUBES FOR MACHINE LEVERS
S-164	METAL TOWER LOCKER FOR RECORD PLANS

MASTS - LADDERS - PLATFORMS - FITTINGS

COLOR POSITION LIGHT SIGNAL -

S-194	LADDERS FOR COLOR POSITION LIGHT SIGNALS
S-195	LADDER STAYS, HANDRAIL, AND PLATFORM FOR COLOR POSITION LIGHT SIGNALS

MASTS - LADDERS - PLATFORMS - FITTINGS (Cont.)

COLOR POSITION LIGHT SIGNAL (CONT.)

S-320	SIGNAL MASTS (DETAILS AND ASSEMBLY)
S-321	SOCKET BASE FOR 5 INCH BRIDGE MAST
S-363	SOCKET BASE FOR 5 INCH MAST
S-362	SHORT PINNAELE

FLASHING LIGHT SIGNALS -

S-394	BASE FOR 4 INCH MAST
S-421	BOLTS FOR CROSSING SIGNS (4 or 5 INCH PIPE)

MECHANICAL SEMAPHORE -

S-376	LADDER PARTS
S-377	LADDER HANDRAILS
S-378	LADDER PLATFORMS

MECHANICAL TRAIN ORDER -

S-374	LADDERS FOR TWO-WAY SINGLE-LAMP SIGNAL

NUMBER BOARDS - FITTINGS

S-200	SIGNAL NUMBER BOARDS

PIPE LINE FITTINGS

MECHANICAL -

S-326	ANCHOR POST
S-386	COTTERS

PIPE LINE FITTINGS (Cont.)

MECHANICAL

S-300	CRANK AND JAW PINS
S-304	JAWS-TANG END AND ADJUSTABLE LINK
S-331	LOW ROCKING SHAFT BEARINGS
S-334	MULTIPLE VERTICAL CRANK STAND (DETAILS)
S-315	ONE-WAY HORIZONTAL CRANK STAND ASSEMBLY
S-301	ONE INCH SIGNAL PIPE AND COUPLINGS
S-338	ONE-WAY PIPE CARRIERS
S-308	PIPE ADJUSTING SCREWS
S-344	PIPE CARRIER - ASSEMBLY
S-345	PIPE CARRIER - DETAILS
S-351	PIPE LINE INSULATION
S-328	ROCKING SHAFT ARMS
S-329	ROCKING SHAFT BEARINGS
S-330	ROCKING SHAFT ASSEMBLY AND DETAILS
S-302	SCREW AND SOLID JAWS
S-333	SINGLE VERTICAL CRANK STAND - DETAILS AND ASSEMBLY
S-303	SOLID JAWS WITH TANG ENDS
S-360	STUFFING BOX - FOR ONE INCH PIPE
S-309	TANG END - LUG AND COMP. LINK
S-336	TRANSVERSE PIPE CARRIERS - ASSEMBLY
S-337	TRANSVERSE PIPE CARRIERS - DETAILS
S-375	TANG END WITH SCREW JAW

POLE LINE

S-511	ARRANGEMENT OF TACKLE FOR PULLING SUSPENSION STRAND
S-500	CARRAGE BOLT - 3/8 INCH
S-525	CAST-IRON STRAND CONNECTOR
S-524	COBS FOR STEEL PINS
S-532	SPECIAL 10 FT. CROSSARMS FOR STEEL PINS
S-501	CROSS ARM BOLT
S-517	CROSS ARM STEEL PIN - 1/2 INCH
S-531	INSTALLING WOOD AND STEEL PINS
S-502	DOUBLE ARMING BOLT
S-533	METHOD OF ATTACHING SINGLE CROSSARM

POLE LINE (Cont.)

S-533	METHOD OF ATTACHING DOUBLE CROSSARM
S-518	FETTER DRIVE SCREW - 3/8 INCH
S-522	FETTER DRIVE SCREW - 1/2 INCH
S-503	FLAT CROSS BRACES
S-511	GRADE CLAMP - TYPICAL INSTALLATION
S-514	GUY CLAMP - TWO BOLT
S-504	GUY CLAMP - THREE BOLT
S-515	GUY HOOK
S-521	GUY PLATE
S-529	ATTACHMENT OF 3/8 INCH GUYS AND 1/2 INCH GUYS WHERE GUY HOOKS ARE NOT REQUIRED
S-529	ATTACHMENT OF 1/2 INCH GUYS TO POLES WHERE GUY HOOKS ARE NOT REQUIRED
S-530	METHOD OF ATTACHING GUYS TO GUY RODS
S-526	THIMBLELESS GUY RODS
S-508	INSULATING CLAMP FOR ATTACHING SUSPENSION STRAND TO BRIDGES
S-145	LINE WIRE SPLICES & TIES
S-505	MESSENGER CLAMP - ONE BOLT
S-506	MESSENGER CLAMP - THREE BOLT
S-516	MESSENGER REINFORCING LINK
S-527	METHOD OF DETERMINING "PULL" AT CORNER POLE
S-132	POLE LINE FITTINGS
S-140	CABLE POSTS & FITTINGS
S-528	PROTECTION OF CABLE BY MEANS OF WOOD MOULDING
S-528	PROTECTION OF LEAD SHEATH CABLE AT TROLLEY CROSSINGS
S-512	REINFORCING LINKS AT INSIDE CORNERS - USE OF
S-519	REINFORCING STRAP
S-520	SAFETY STRAP
S-169	TYPICAL ARRANGEMENT FOR SERVICE CONNECTION
S-512	SUSPENSION CLAMPS AT OUTSIDE CORNERS - USE OF 1/2 INCH
S-508	SUSPENSION STRAND ON BRIDGES - WOOD BLOCK SUPPORT FOR
S-509	SUSPENSION STRAND AT "H" FIXTURE TERMINALS - METHOD OF TERMINATING
S-513	SUSPENSION STRAND TO "H" FIXTURES - METHOD OF ATTACHING
S-509	SUSPENSION STRAND ON POLES - METHOD OF DEAD-ENDING
S-507	SUSPENSION STRAND TO POLES - METHOD OF ATTACHING 1/4" & 3/8"
S-507	SUSPENSION STRAND TO POLES - METHOD OF ATTACHING 1/2"
S-510	SUSPENSION STRAND FOR SPANS OF OVER NORMAL LENGTH-REINFORCING
S-510	SUSPENSION STRAND - METHOD OF SPLICING
S-530	INSTALLING SINGLE CIRCUIT TRANSPOSITION BRACKETS

POLE LINE (Cont.)

S-146	LINE WIRE SPLICES & TIES
S-131	METHOD OF TERMINATING LINE WIRE
S-523	WASHERS
S-513	WALL BRACKETS FOR SUPPORTING SUSPENSION STRAND ON WALLS - USE OF
S-130	LAYOUT FOR TRANSFORMER CONNECTIONS 440 VOLT SIGNAL POWER LINE

RAIL BONDS - CONNECTORS - BOOTLEGS

S-127	BONDS FOR RAIL JOINTS
S-112	INSULATED JOINT LOCATIONS
S-111	TRENCH CABLE BOOTLEGS
S-108	METHOD OF TERMINATING U.G. CABLE AND RAIL CONNECTORS
S-128	FROG & SWITCH BONDS
S-171	TRACK SHUNTING ARRANGEMENT - SWITCH CIRCUIT CONTROLLER ARRANGEMENT FOR LINE OR W.P. CIRCUITS
S-138	FROG & SWITCH BONDING

RELAY CASES - ACCESSORIES

S-114	TYPICAL ARRANGEMENT OF APPARATUS IN 9 WAY RELAY CASE G.R.S.NO. 56101-131-GR. 1
S-115	TYPICAL ARRANGEMENT OF APPARATUS IN 12 WAY RELAY CASE G.R.S.NO. 56101-94-GR. 1
S-116	TYPICAL ARRANGEMENT OF APPARATUS IN 24 WAY RELAY CASE G.R.S.NO. 56101-95-GR. 1
S-117	TYPICAL ARRANGEMENT OF APPARATUS IN 36 WAY RELAY CASE G.R.S.NO. 56101-96-GR. 1
S-119	TYPICAL ARRANGEMENT OF APPARATUS IN 3 WAY RELAY CASE G.R.S.NO. 54311-97-GR. 1
S-121	TYPICAL ARRANGEMENT OF APPARATUS IN 6 WAY RELAY CASE G.R.S.NO. 54311-96-GR. 1
S-126	TERMINAL ARRANGEMENT FOR STEEL RELAY CASES
S-129	TERMINAL BOARD FITTINGS FOR STEEL RELAY CASES

RELAY CASES - ACCESSORIES (Cont.)

S-175	TOWER RELAY RACK
S-120	SHEET METAL RELAY HOUSINGS

SAFETY FENCE

A25-10A SAFETY FENCE

SIGNS

S-180	END OF TRACK CIRCUIT AND CUT SECTION SIGNS
S-177	GRADE & TUNNEL MARKERS
S-178	MARKER FITTINGS
S-179	METHOD OF APPLYING GRADE & TUNNEL MARKERS
S-457	ADAPTER CLAMP (4" TO 8" PIPE)
S-458	BRACKET
S-455	ELECTRIC LIGHT UNIT (ILLUMINATED HIGHWAY CROSSING SIGN)
S-456	ILLUMINATED HIGHWAY CROSSING SIGN (FRONT OF MAST MOUNTING FOR 4" TO 8" PIPE)
S-413	90° CAST-IRON CROSSING SIGN
S-416	90° REFLECTOR CROSSING SIGN ASSEMBLY
S-417	REFLECTOR STOP ON RED SIGNAL SIGN

SIGNALS

COLOR POSITION LIGHT

S-185	ASSEMBLIES OF COLOR POSITION LIGHT SIGNALS
S-196	COLOR POSITION LIGHT SIGNALS FOR BRACKET POST OR CANTILEVER
S-197	COLOR POSITION LIGHT GROUND SIGNALS
S-198	MARKER LIGHTS FOR COLOR POSITION LIGHT SIGNALS

SIGNALS (Cont.)

COLOR POSITION LIGHT (CONT.)

S-199	COLOR POSITION LIGHT SIGNALS FOR SIGNAL BRIDGES
S-208	PIPE BRACKET POST AND MATERIAL LIST

ELECTRIC SEMAPHORE -

S-332	TORQUE CURVES FOR ELECTRIC SEMAPHORE SPECTACLES

MECHANICAL SEMAPHORE -

S-327	CLAMP FOR BASE OF GROUND MAST SIGNALS
S-357	DETAILS AND ASSEMBLY OF MECHANICAL SEMAPHORE BEARINGS
S-350	DIAGRAM OF SPECTACLE CLEARANCE
S-347	FILLER BLOCK - DETAILS AND ASSEMBLY
S-348	FILLER BLOCK - DETAILS AND ASSEMBLY
S-349	FILLER BLOCK - DETAILS AND ASSEMBLY
S-310	GUIDE CLAMPS FOR VERTICAL CONNECTIONS ON SIGNALS
S-318	GUIDE SUPPORTS AND CAPS FOR VERTICAL CONNECTIONS ON SIGNALS
S-319	GUIDE FOR VERTICAL CONNECTIONS ON SIGNAL
S-354	OIL FOUNT
S-353	SEMAPHORE LAMP - ONE LENS
S-305	SEMAPHORE SPECTACLE
S-358	OPERATING CONNECTION FOR MECHANICAL SIGNALS
S-343	"U" BOLT AND CLAMP (FOR SIGNAL MASTS)

HIGHWAY CROSSING -

S-204	AUTOMATIC ROADWAY AND SIDEWALK GATE ARMS MOUNTED ON STUB MAST
S-205	AUTOMATIC ROADWAY GATE ARM MOUNTED ON STUB MAST
S-188	CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH 6' 0" OR 8' 0" OFFSET AND MATERIAL LIST
S-189	CANTILEVER TYPE FLASHING LIGHT HIGHWAY SIGNAL WITH 10' 0" OR 12' 0" OFFSET AND MATERIAL LIST
S-414	DOUBLE ADAPTER CLAMP AND DETAILS FOR CROSSING SIGNS (4" TO 8" PIPE)
S-186	FLASHING LIGHT HIGHWAY CROSSING SIGNAL LAYOUT
S-187	FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH AUTOMATIC SHORT ARM GATE

SIGNALS (Cont.)

S-206	FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH AUTOMATIC ROADWAY AND SIDEWALK GATE ARMS
S-402	HIGHWAY CROSSING GATE ARMS
S-191	"NO TURN" HIGHWAY CROSSING SIGN AND MATERIAL LIST
S-362	SHORT PINNACLE
S-363	SOCKET BASE FOR 5 INCH MAST

TRAIN ORDER (LIGHT TYPE)

S-167	TRAIN ORDER SIGNAL (LIGHT TYPE)
S-168	TRAIN ORDER BOARD

TRAIN ORDER (MECHANICAL)

S-372	CRANK BEARING AND CLAMPS
S-373	DOUBLE SPECTACLE BEARING AND LAMP BRACKET
S-359	TWO LEVER WALL MACHINE
S-361	TWO WAY-SINGLE LAMP SIGNAL

TYPICAL LOCATIONS

S-142	SIGNAL LOCATIONS FOR SINGLE TRACK (SINGLE & TWIN LOCATIONS)
S-144	SIGNAL LOCATIONS AT END OF PASSING SIDING - SINGLE TRACK
S-149	SIGNAL LOCATIONS AT END OF PASSING SIDING
S-150	CUT SECTION LOCATIONS FOR SINGLE OR MULTIPLE TRACK
S-151	SIGNAL LOCATIONS FOR DOUBLE TRACK
S-207	TYPICAL LOCATION PLAN FOR HIGHWAY CROSSING SIGNALS

SWITCH LAYOUTS

S-136	MECHANICAL SWITCH LAYOUT USING SWIVEL TYPE FRONT ROD AND MATERIAL LIST
S-147	LAYOUT FOR 5A-B-C-D SWITCH MACHINES AND MATERIAL LIST
S-159	HAND THROW SWITCH LAYOUT WITH MODEL 10 ELECTRIC LOCK & RAPRO SWITCH STAND
S-160	LAYOUT FOR STYLE "A5" E.P.S.& L. MOVEMENT AND MATERIAL LIST
S-161	LAYOUT FOR STYLE "M2"-"M22 A&B" SWITCH MACHINES & MATERIAL LIST
S-165	LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 9A ELECTRIC LOCK
S-166	LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK
S-170	HAND THROW SWITCH LAYOUT WITH 9A ELECTRIC LOCK
S-201	SPRING SWITCH LAYOUT FOR NO. 16 TURNOUT USING STYLE S20 & S21 FACING POINT LOCK
S-202	SPRING SWITCH LAYOUT

SWITCH-PARTS

S-370	BALL STUDS
S-104	DETAILS & METHOD OF APPLYING 3-BE BOSSERT SWITCH POINT ADJUSTER
S-364	SWITCH CIRCUIT CONTROLLER LUGS
S-365	SWITCH CIRCUIT CONTROLLER RODS
S-382	LAG SCREW SPIKES
S-183	LOCK RODS
S-184	OPERATING RODS
S-388	PLUNGER SWITCH LOCK
S-182	POINT DETECTOR RODS
S-152	SPECIAL SWITCH TIES
S-163	SWIVEL TYPE FRONT ROD (DETAIL & ASSEMBLY)

SWITCH-PARTS (Cont.)

TYPICAL SWITCH CIRCUITS

C-100	CIRCUITS FOR STYLE "M" S.L.M. USING DP-25 & OR-11 RELAYS
C-101	CONTROL AND INDICATION CIRCUITS FOR STYLE "M" S.L.M. USING DP-25 & OR-11 RELAY
S-104	WIRING FOR 5 D SWITCH MACHINE WITH BIASED NEUTRAL CONTROLLER
S-105	WIRING FOR 5 C SWITCH MACHINE WITH BIASED NEUTRAL CONTROLLER
C-106	WIRING FOR STYLE "M20" S & L MOVEMENT WITH BIASED NEUTRAL CONTROLLER

TERMINAL BOXES

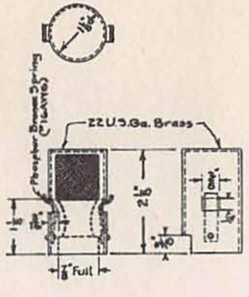
S-122	SHEET METAL TERMINAL CASES

TOOLS

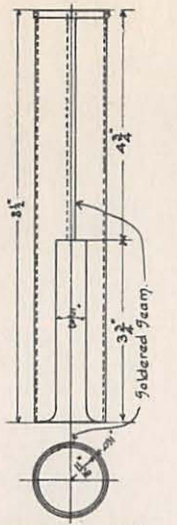
S-162	EMERGENCY TOOL BOARD

WIRING ACCESSORIES

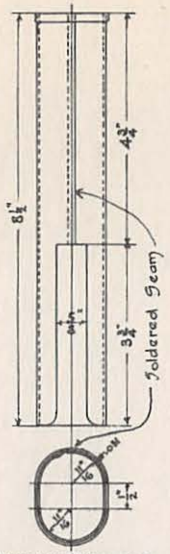
S-143	FUSES USED BY SIGNAL DEPARTMENT
S-306	MULTIPLE UNIT TERMINAL BLOCKS
S-307	TERMINAL BLOCKS
S-339	TERMINAL CONNECTORS
S-137	WIRING ACCESSORIES


Phosphor Bronze Spring (#16 Ga.)
22 U.S.Ga. Brass
2 5/8"
1 1/8"
7/8" Full

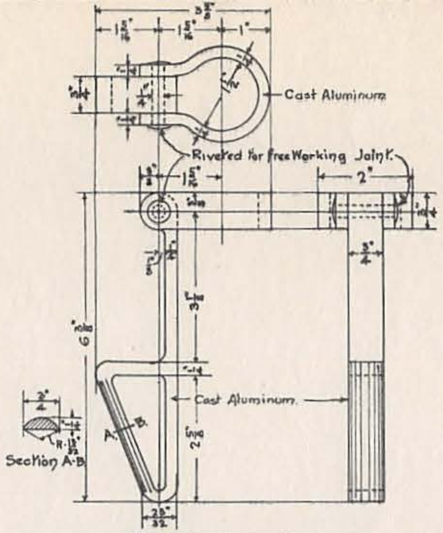
REMINDER TUBE FOR
U.S.&S.Co. MODEL 14
POWER INTERLOCKING MACHINE
WITH ROUND LATCH HANDLE
#301.


8 1/2"
4 3/4"
3 3/4"
Soldered Seam

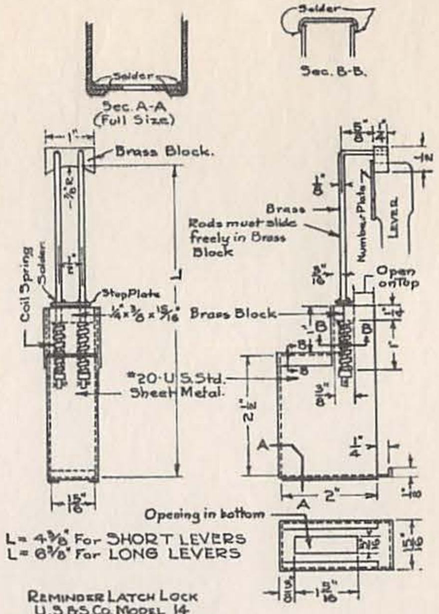
REMINDER TUBE FOR
G.R.S.Co. MODEL 2
ELEC. INTERLOCKING MACH.
#22 Ga. Sheet Steel.
#302


8 1/2"
4 3/4"
3 3/4"
Soldered Seam

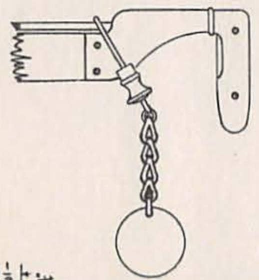
REMINDER TUBE FOR
G.R.S.Co. UNIT LEVER
ELEC. INTERLOCKING MACH.
#22 Ga. Sheet Steel.
#303.

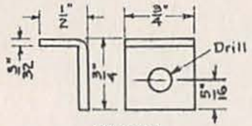

3 5/8"
1 5/16"
1 5/16"
1"
Cast Aluminum
Riveted for Free Working Joint.
1 5/16"
2"
6 3/16"
3 1/16"
3/4"
Cast Aluminum
2 5/16"
Section A-B
R. 13/32"
A.
B.
25/32"

REMINDER LATCH LOCK FOR
MECHANICAL INTERLOCKING MACHINES.
#304.

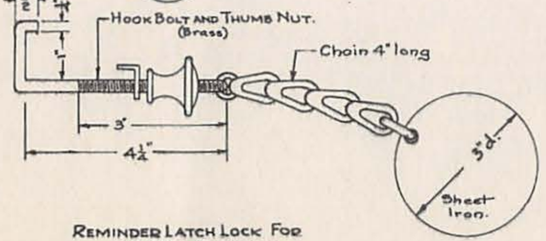

Solder
Sec. A-A
(Full Size)
Solder
Sec. B-B.
1"
Brass Block.
Coil Spring
Solder
Step Plate
1/4" x 3/8" x 15/16"
Brass Block
#20 U.S. Std. Sheet Metal.
L
15/16"
Brass
Rods must slide freely in Brass Block
Number Plate
LEVER
Open on Top
B
A
2 1/2"
2"
Opening in bottom
15/16"
1 5/16"
L = 4 3/8" For SHORT LEVERS
L = 6 3/8" For LONG LEVERS

REMINDER LATCH LOCK
U.S.&S.Co. MODEL 14
POWER INTERLOCKING MACHINE
WITH WING NUT LATCH HANDLE
#305 For SHORT LEVER.
#306 For LONG LEVER.

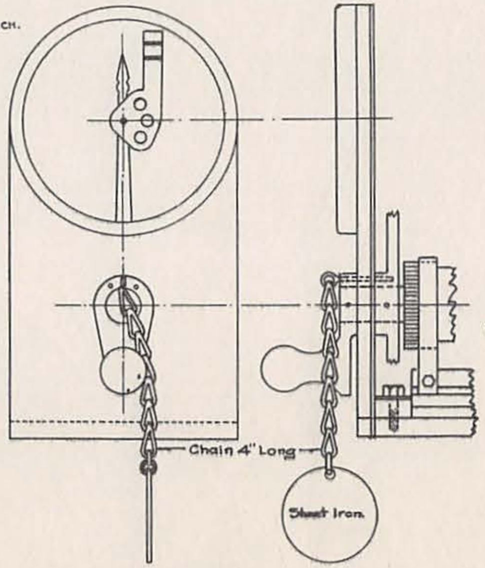



1/2"
3/4"
3/32"
3/4"
Drill for 1/4" Hook Bolt.
5/16"

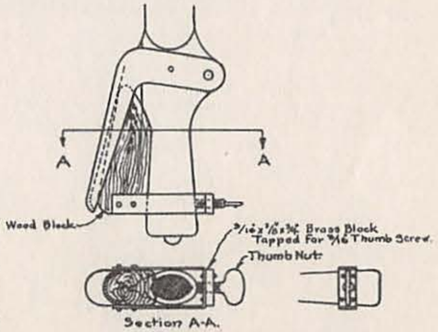
WASHER
(Brass)
Scale = Full Size.


1/2"
1/4"
1"
Hook Bolt and Thumb Nut. (Brass)
Chain 4" long
3"
4 1/2"
3" d.
Sheet Iron.

REMINDER LATCH LOCK FOR
G.R.S.Co. ELECTRIC
INTERLOCKING MACHINE. WITH
DETECTOR LOCK
#307.


Chain 4" Long
Sheet Iron.

REMINDER LATCH LOCK FOR
ELECTRICALLY LOCKED SEMAPHORE INDICATOR
#308


A
A
Wood Block
5/16" x 7/8" x 3/4" Brass Block
Tapped for 5/16 Thumb Screw.
Thumb Nut.
Section A-A.

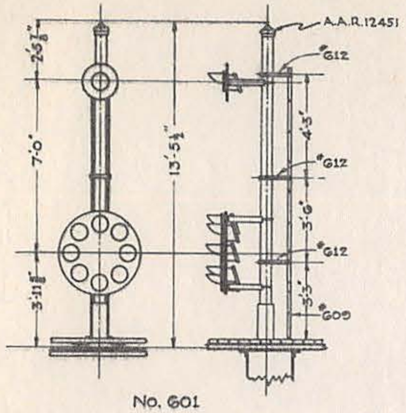
REMINDER LATCH LOCK
ELECTRO MECHANICAL INTERLOCKING MACHINE
#309.

BALTIMORE & OHIO RAILROAD

REMINDER TUBES
FOR MACHINE LEVERS

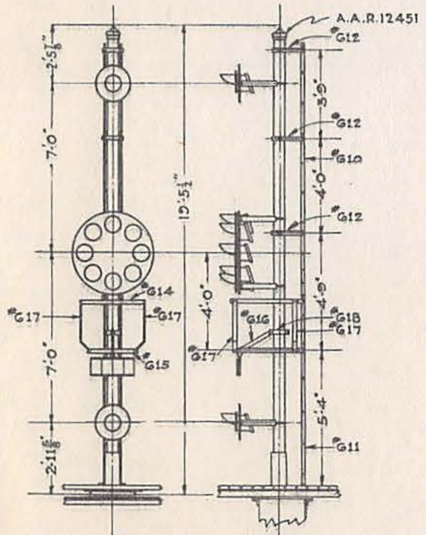
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 11, 1946

25-3-A



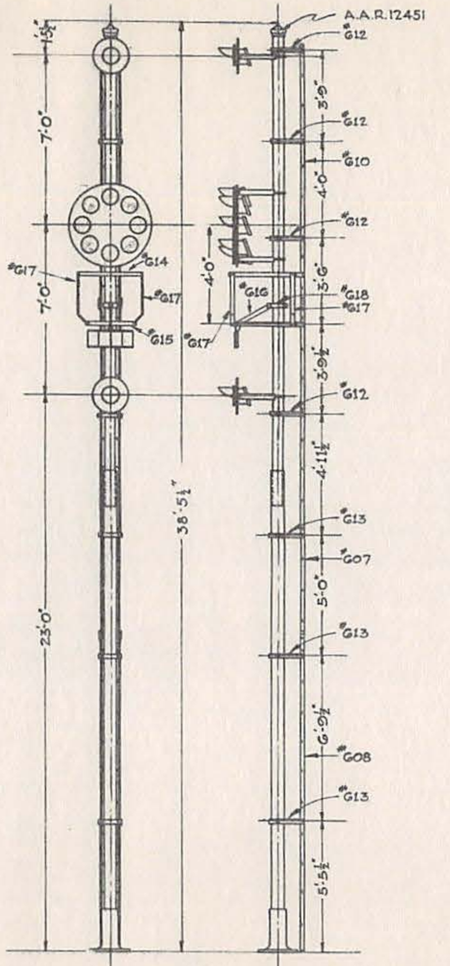
A.A.R.12451
#G12
#G12
#G12
#G12
#G09
2'-5 7/8"
7'-0"
3'-11 7/8"
13'-5 1/4"
4'-3"
3'-6"
3'-3"

No. G01



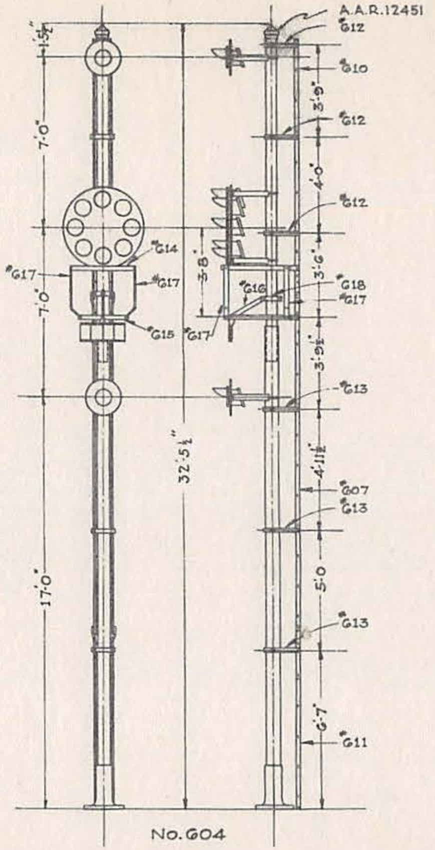
A.A.R.12451
#G12
#G12
#G10
#G12
#G14
#G17
#G17
#G15
#G16
#G17
#G18
#G17
#G11
2'-5 7/8"
7'-0"
7'-0"
2'-11 7/8"
19'-5 1/4"
3'-9"
4'-0"
4'-0"
4'-9"
5'-4"

No. G02



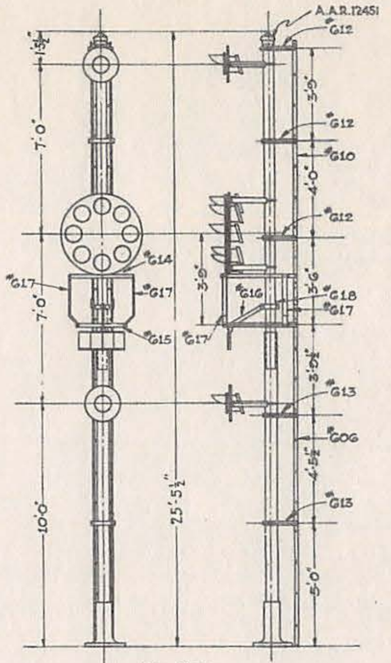
A.A.R.12451
#G12
#G12
#G10
#G12
#G14
#G17
#G17
#G15
#G16
#G17
#G18
#G17
#G12
#G13
#G07
#G13
#G08
#G13
1'-5 1/4"
7'-0"
7'-0"
23'-0"
38'-5 1/4"
4'-0"
3'-9"
4'-0"
3'-6"
3'-9 1/2"
4'-11 1/2"
5'-0"
6'-9 1/2"
5'-5 1/2"

No. G03



A.A.R.12451
#G12
#G10
#G12
#G12
#G14
#G17
#G17
#G15
#G16
#G17
#G18
#G17
#G13
#G07
#G13
#G13
#G11
1'-5 1/4"
7'-0"
7'-0"
17'-0"
32'-5 1/4"
3'-8"
3'-9"
4'-0"
3'-6"
3'-9 1/2"
4'-11 1/2"
5'-0"
6'-7"

No. G04



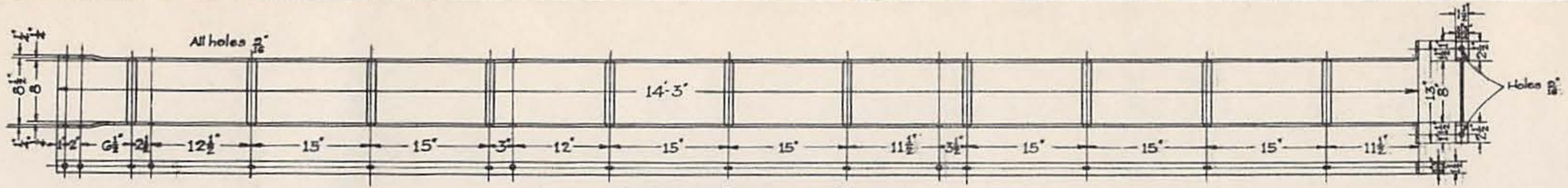
A.A.R.12451
#G12
#G12
#G10
#G12
#G14
#G17
#G17
#G15
#G16
#G17
#G18
#G17
#G13
#G06
#G13
1'-5 1/4"
7'-0"
7'-0"
10'-0"
25'-5 1/4"
3'-9"
3'-9"
4'-0"
3'-6"
3'-9 1/2"
4'-5 1/2"
5'-0"

No. G05

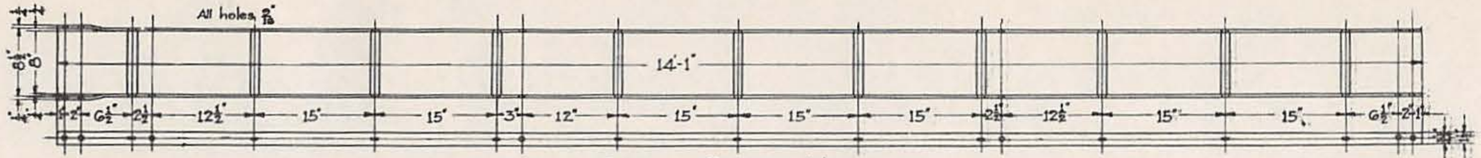
BALTIMORE & OHIO RAILROAD

C.P.L. SIGNAL ASSEMBLIES

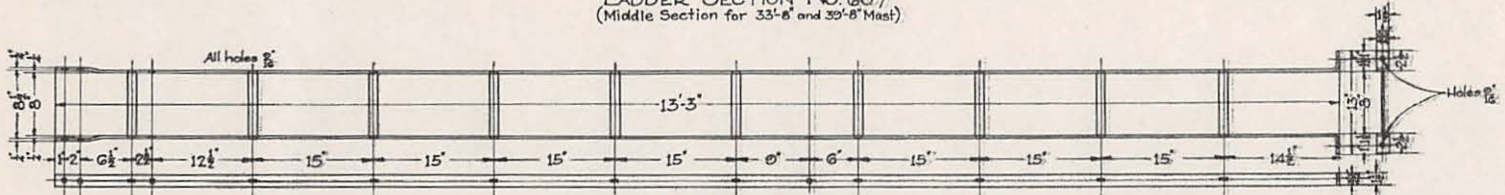
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 15, 1946


All holes 9/16"
14'-3"
Holes 9/16"

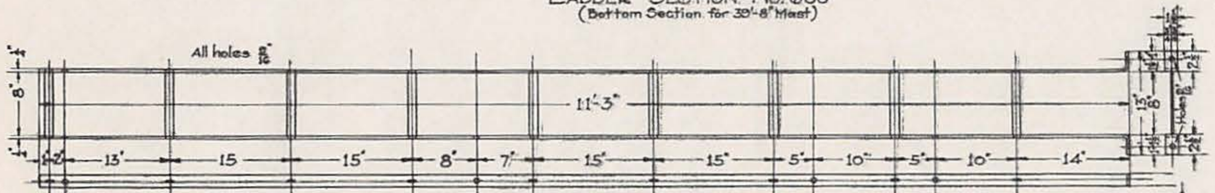
Ladder Section No. 606
(Bottom Section for 26'-8" Mast)


All holes 9/16"
14'-1"

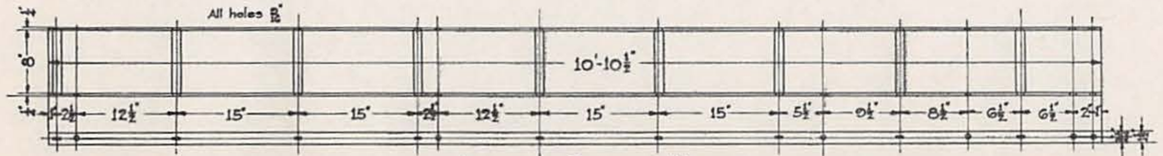
Ladder Section No. 607
(Middle Section for 33'-8" and 39'-8" Mast)


All holes 9/16"
13'-3"
Holes 9/16"

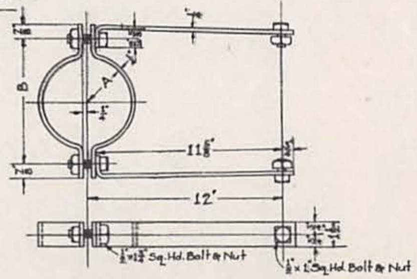
Ladder Section No. 608
(Bottom Section for 39'-8" Mast)


All holes 9/16"
11'-3"

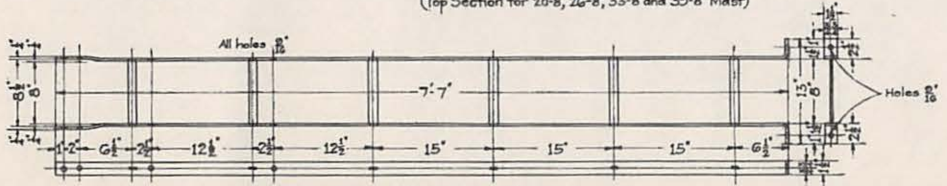
Ladder Section No. 609
(Section for 14'-8" Mast)


All holes 9/16"
10'-10½"

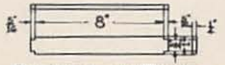
Ladder Section No. 610
(Top Section for 20'-8", 26'-8", 33'-8" and 39'-8" Mast)


A
B
11⅝"
12"
Sq. Hd. Bolt & Nut
Sq. Hd. Bolt & Nut

Stay Complete
No. 612 - 5" Pipe - A = 2¾" - B = 7¾"
No. 613 - 6" Pipe - A = 3 5/16" - B = 8⅞"


All holes 9/16"
7'-7"
Holes 9/16"

Ladder Section No. 611
(Bottom Section for 20'-8" and 33'-8" Mast)

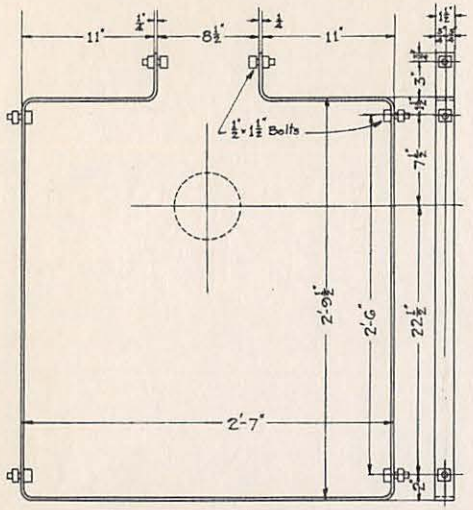


Details of Rung

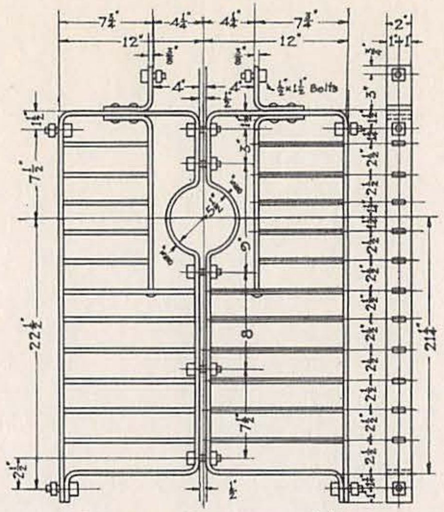
Baltimore & Ohio Railroad

Ladders & Stays
For C.P.L. Signals

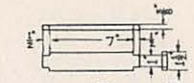
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Aug. 15, 1946


11"
8½"
11"
½×1½ Bolts
2'-9½"
2'-6"
22½"
7½"
3"
2'-7"

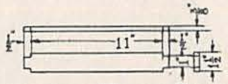
HANDRAIL NO. 614


7½"
4½"
4½"
7½"
12"
12"
2"
½×1½ Bolts
5¼"
7½"
22½"
21¼"
8"
3"

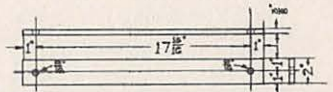
LADDER PLATFORM NO. 615



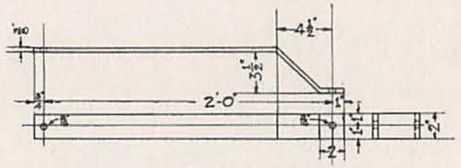
PLATFORM RUNG DETAILS



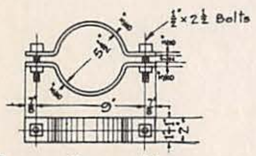
PLATFORM RUNG DETAILS



PLATFORM BRACE NO. 616



HANDRAIL BRACE NO 617


½×2½ Bolts
5¼"
9"
2"

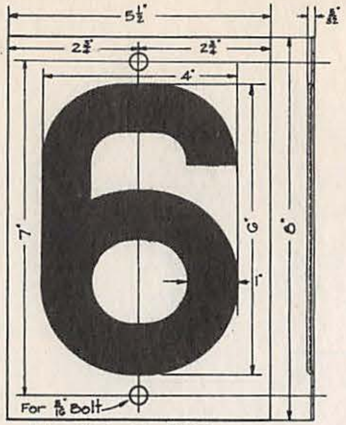
BRACE CLAMP NO. 618

BALTIMORE & OHIO RAILROAD

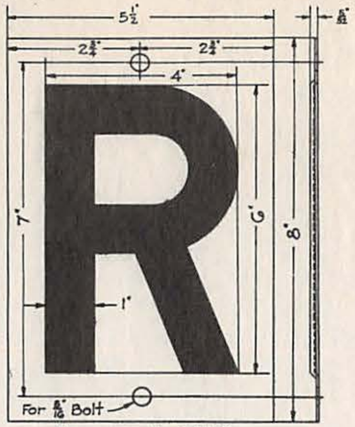
HANDRAIL & PLATFORM
FOR C.P.L. SIGNALS

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 11, 1946

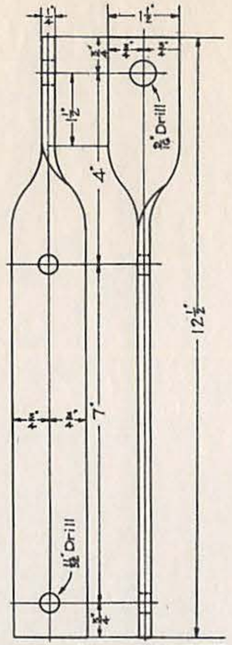
25-6-B


5½"
2¾"
2¾"
4"
7"
6"
8"
1"
For 5/16" Bolt

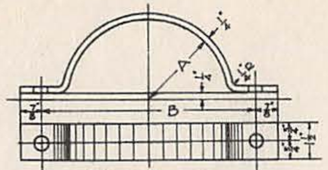
NUMERAL No. 8G361


5½"
2¾"
2¾"
4"
7"
6"
8"
1"
For 5/16" Bolt

LETTER No. 8G362

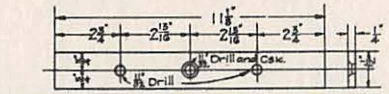

1½"
4"
7"
12½"
11/32" Drill
5/16" Drill

VERTICAL SUPPORT No. 8G37
FOR HORIZONTAL NUMBERING

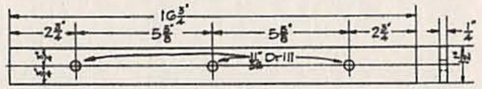


HALF CLAMP

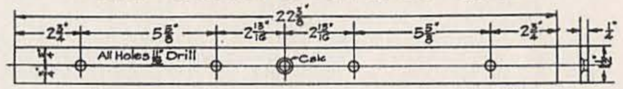
FOR 5" PIPE No. 8G391 A-2¾"-B-7¾"
FOR 6" PIPE No. 8G392 A-3 5/16"-B-8⅞"


11⅛"
2¾"
2 13/16"
2 13/16"
2¾"
11/32" Drill and Csk.
11/32" Drill

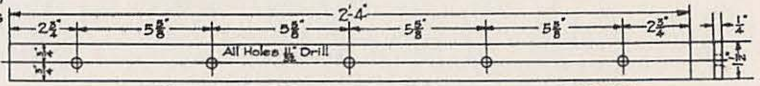
HORIZONTAL SUPPORT FOR 2 CHARACTERS No. 8G352


16¾"
2¾"
5⅝"
5⅝"
2¾"
11/32" Drill

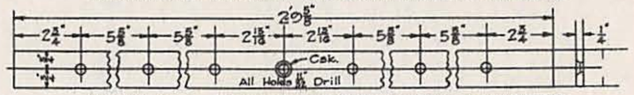
HORIZONTAL SUPPORT FOR 3 CHARACTERS No. 8G353


22⅜"
2¾"
5⅝"
2 13/16"
2 13/16"
5⅝"
2¾"
All Holes 11/32" Drill
Csk.

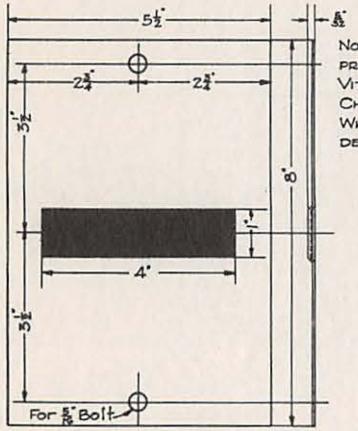
HORIZONTAL SUPPORT FOR 4 CHARACTERS No. 8G354


2'-4"
2¾"
5⅝"
5⅝"
5⅝"
5⅝"
2¾"
All Holes 11/32" Drill

HORIZONTAL SUPPORT FOR 5 CHARACTERS No. 8G355


20⅝"
2¾"
5⅝"
5⅝"
2 13/16"
2 13/16"
5⅝"
5⅝"
2¾"
Csk.
All Holes 11/32" Drill

HORIZONTAL SUPPORT FOR 6 CHARACTERS No. 8G356


5½"
2¾"
2¾"
3½"
3½"
4"
1"
8"
For 5/16" Bolt

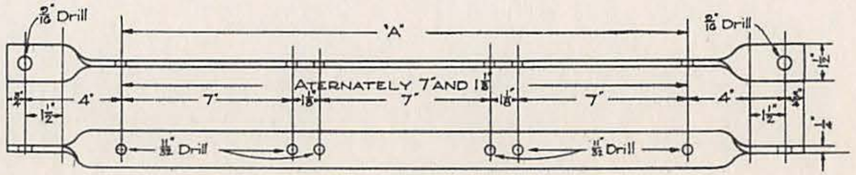
DASH No. 8G363

NO. 16 U.S.S. GAGE O.H. STEEL WITH CHARACTERS PRESSED UP TO BE ENAMELED WITH 3 COATS OF VITREOUS ENAMEL.

CHARACTERS TO BE WHITE ON BLACK BACKGROUND

WHEN ORDERING SPECIFY NUMERALS OR LETTERS DESIRED.

A=1'-3⅛"	For 2	Characters	No. 8G382
" =1'-11¼"	" 3	"	No. 8G383
" =2'-7⅜"	" 4	"	No. 8G384
" =3'-3½"	" 5	"	No. 8G385
" =3'-11⅝"	" 6	"	No. 8G386
" =4'-7¾"	" 7	"	No. 8G387
" =5'-3⅞"	" 8	"	No. 8G388


5/16" Drill
5/16" Drill
"A"
ALTERNATELY 7" AND 1⅛"
4"
7"
1⅛"
7"
1⅛"
7"
4"
1½"
1½"
11/32" Drill
11/32" Drill

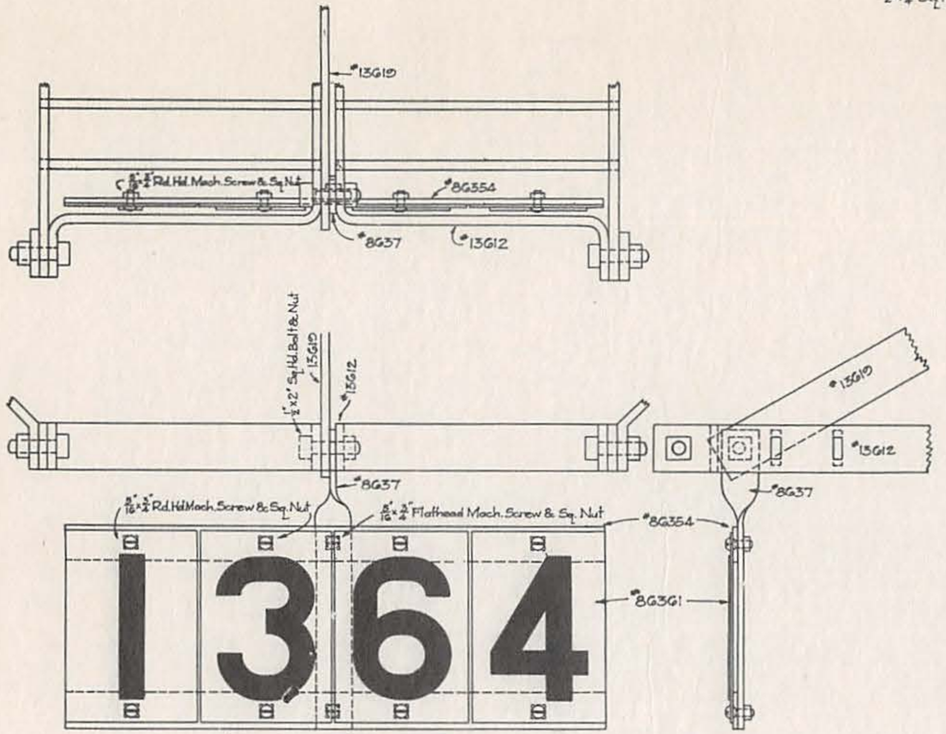
VERTICAL SUPPORT No. 8G383
FOR VERTICAL NUMBERING

BALTIMORE & OHIO RAILROAD

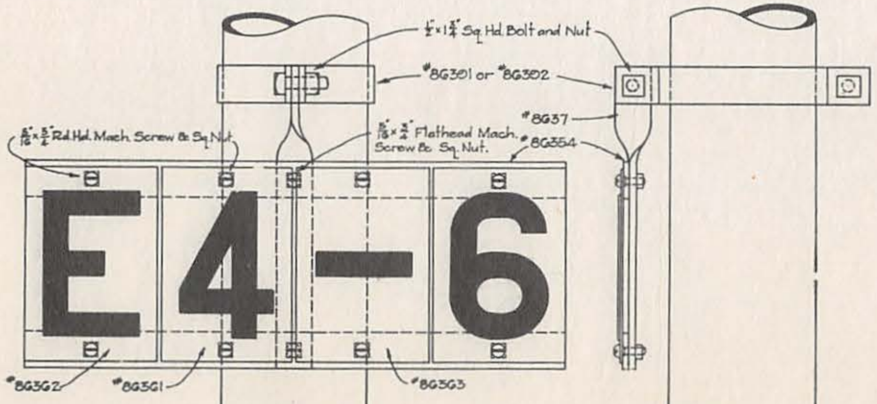
NUMERALS AND LETTERS FOR SIGNAL NUMBERING

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 31, 1946

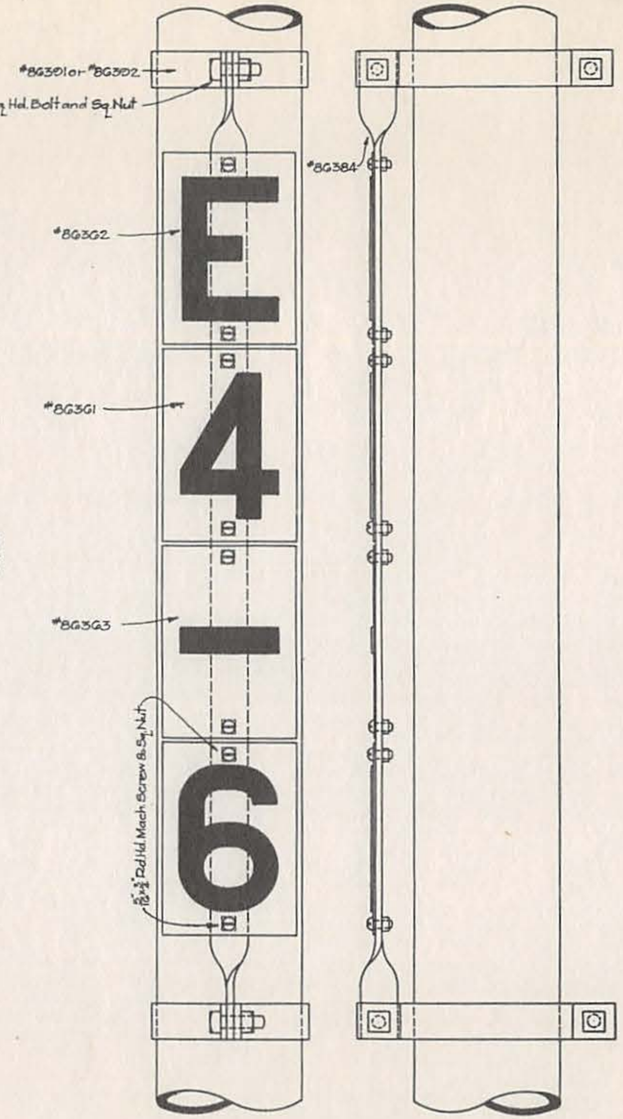
25-86-C


#13G19
5/16"×3/4" Rd.Hd.Mach.Screw & Sq.Nut
#8G354
#8G37
#13G12
1/2"×2" Sq.Hd.Bolt & Nut
13G19
#13G12
#8G37
5/16"×3/4" Rd.Hd.Mach.Screw & Sq.Nut
5/16"×3/4" Flathead Mach.Screw & Sq.Nut
#8G354
#13G19
#13G12
#8G37
1364
#8G3G1

Assembly and Application
For Color Position Light Signals


1/2"×1 3/4" Sq.Hd.Bolt and Nut
#8G301 or #8G302
5/16"×3/4" Rd.Hd.Mach.Screw & Sq.Nut
5/16"×3/4" Flathead Mach. Screw & Sq.Nut.
#8G37
#8G354
E4-6
#8G3G2
#8G3G1
#8G3G3

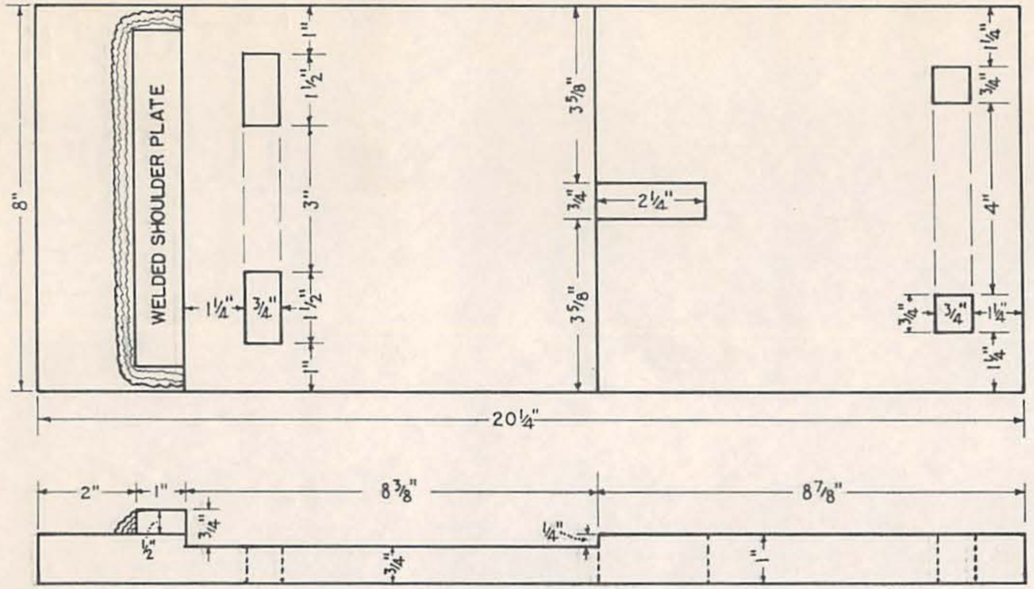
Assembly and Application
For Horizontal Numbering
Semaphore Signals


#8G301 or #8G302
1/2"×1 3/4" Sq.Hd.Bolt and Sq.Nut
#8G384
#8G3G2
#8G3G1
#8G3G3
5/16"×3/4" Rd.Hd.Mach.Screw & Sq.Nut
E
4
-
6

Assembly and Application
For Vertical Numbering
Semaphore Signals

BALTIMORE & OHIO RAILROAD
NUMERALS AND LETTERS
FOR SIGNAL NUMBERING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 16, 1946

25-86-D



FOR ALL RAILS 100 LB. AND LESS

LENGTH OF SWITCH	NUMBER REQUIRED	
	PLATES	BRACES
11	12	12
13	14	14
16½	18	18
24	26	26
30	34	34

NON-ADJUSTABLE SWITCH BRACE
TABLE OF PATTERN REFERENCES

WEIGHT & SECTION OF RAIL	REQUISITIONS TO SPECIFY
60# A.S.C.E.	B.& O. PATTERN MARKED 60A
67# A.S.C.E.	" " " 67A
70# A.S.C.E.	" " " 70A
75# A.S.C.E.	" " " 75A
80# A.S.C.E.	" " " 80A
90# R.B.	" " " 90 RB
100# A.S.C.E.	" " " 100A
85# A.S.C.E.	P.R.A.CO. PLAN 11516
90# R.A.	" " " 11959
100# R.A.	" " " 11895
100# R.B.	" " " 11172-C
130# R.E.	" " " 8546-A

NOTE

SLIDE PLATES FOR SWITCHES WILL BE MANUFACTURED FROM MILD OPEN HEARTH STEEL MEETING A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS.

SEE B.R.& P.R.R. PLANS FOR SLIDE PLATES AND BRACES USED WITH B.R.& P. STANDARD SWITCHES.

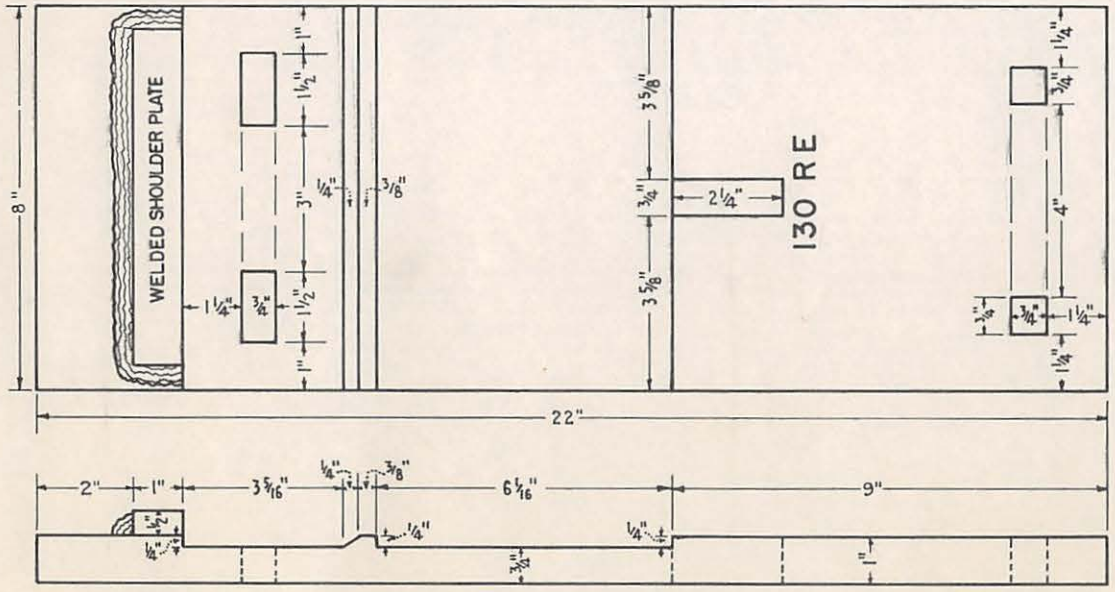
SEE SEPARATE PLAN FOR SLIDE PLATES AND ADJUSTABLE BRACES.

SHOULDER PLATE SHALL BE WELDED TO SLIDE PLATE BEFORE PLANING.

SHOULDER OF SLIDE PLATES MAY BE PRESSED, THEN PLANED, WHERE SUCH PROCEEDURE IS AUTHORIZED.

130 LB. PLATES TO BE MARKED WITH 1/2" LETTERS AND FIGURES AT LEAST 1/16" DEEP AS SHOWN.

FOR LOCATION OF PLATES & BRACES SEE PLANS OF SPLIT SWITCHES.



FOR 130 LB. R.E. RAIL

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

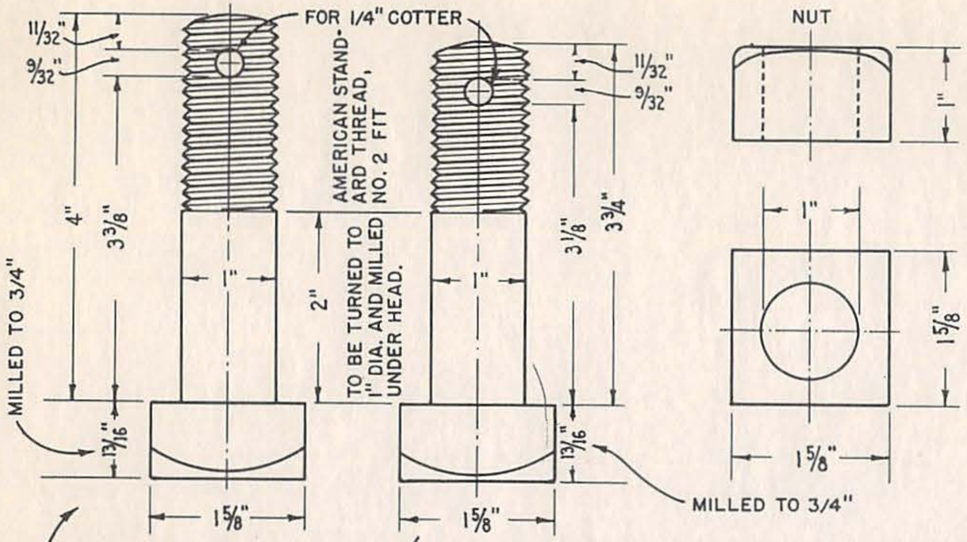
SWITCH SLIDE PLATES AND NON-ADJUSTABLE BRACES FOR RAILS 130 LB. R.E. AND 100 LB. AND LESS

Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 25, 1946

35357A

50J-4

SWITCH STAND CONNECTING ROD BOLTS

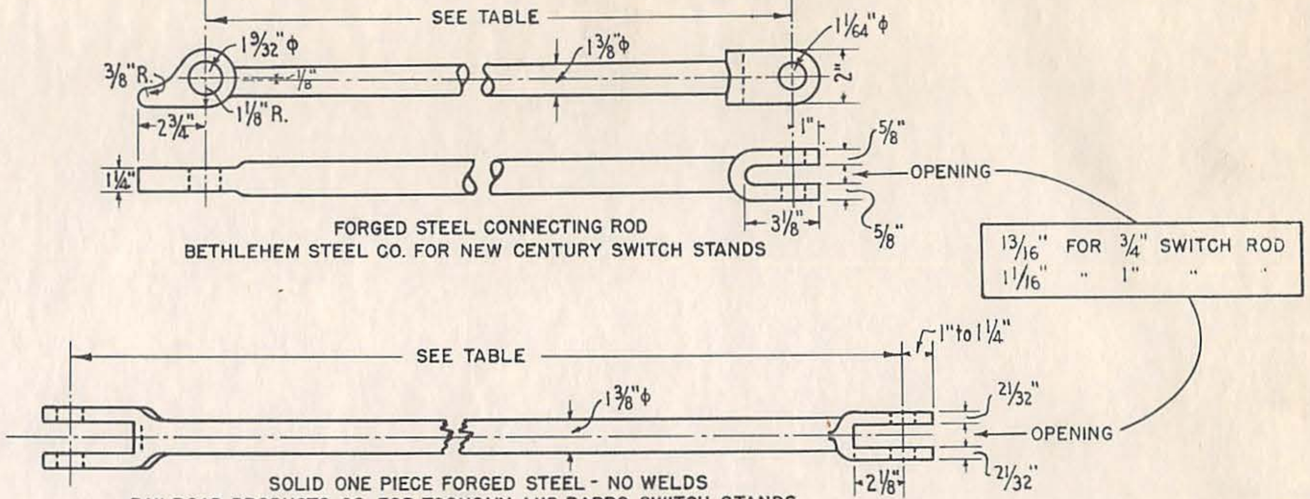


FOR 1/4" COTTER
11/32"
9/32"
4"
3 3/8"
1"
MILLED TO 3/4"
13/16
1 5/8"
2"
AMERICAN STANDARD THREAD, NO. 2 FIT
TO BE TURNED TO 1" DIA. AND MILLED UNDER HEAD.
11/32"
9/32"
3 1/8"
3 3/4"
1"
13/16
1 5/8"
MILLED TO 3/4"
NUT
1"
1"
1 5/8"
1 5/8"

THIS BOLT FOR USE AS SWITCH STAND CONNECTING ROD BOLT, WITH 1" x 3" SWITCH RODS.

THIS BOLT FOR USE AS SWITCH STAND CONNECTING ROD BOLT, WITH 3/4" x 3" SWITCH RODS.

STANDARD SWITCH STAND CONNECTING RODS AS FURNISHED



SEE TABLE
1 9/32" ϕ
3/8" R.
1/8"
1 1/8" R.
2 3/4"
1 3/8" ϕ
1 1/64" ϕ
2"
1"
5/8"
5/8"
1 1/4"
3 1/8"
OPENING
13/16" FOR 3/4" SWITCH ROD
1 1/16" " 1" "
SEE TABLE
1" to 1 1/4"
1 3/8" ϕ
21/32"
21/32"
OPENING
2 1/8"

FORGED STEEL CONNECTING ROD
BETHLEHEM STEEL CO. FOR NEW CENTURY SWITCH STANDS

SOLID ONE PIECE FORGED STEEL - NO WELDS
RAILROAD PRODUCTS CO. FOR ECONOMY AND RAPRO SWITCH STANDS

TABLE
STANDARD SWITCH STAND CONNECTING RODS

KIND OF STAND	DISTANCE BETWEEN TRACK CENTERS	GAUGE LINE TO CENTER OF STAND	LENGTH OF CONNECTING ROD
HIGH	*	6'-10½"	6'-1½"
INTERMEDIATE	*	6'-10½"	6'-1½"
LOW	12' +	3'-6"	2'-9"
	13' +	4'-0"	3'-3"
	14' +	4'-6"	3'-9"
	15' +	5'-0"	4'-3"
	* *	5'-0"	4'-3"

* NOT TO BE USED BETWEEN TRACKS.
** WHEN USED OUTSIDE OF TRACK.

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

APPROVED-
Vice President, Operation & Maintenance

NOTE

BOLTS TO BE AMERICAN STANDARD HEAVY BOLT HEADS AND HEAVY NUTS UNFINISHED EXCEPT AS NOTED ON PLAN.

BOLTS TO BE FURNISHED OF MILD OPEN HEARTH STEEL, TO A.R.E.A. SPECIFICATIONS.

REQUISITIONS TO SPECIFY NUMBER AND LENGTH OF BOLTS REQUIRED, QUOTING THIS PLAN.

WHEN CONNECTING RODS ARE INVOLVED GIVE LENGTH AND MANUFACTURERS SWITCH STAND WITH WHICH TO BE USED.

BALTIMORE & OHIO RAILROAD

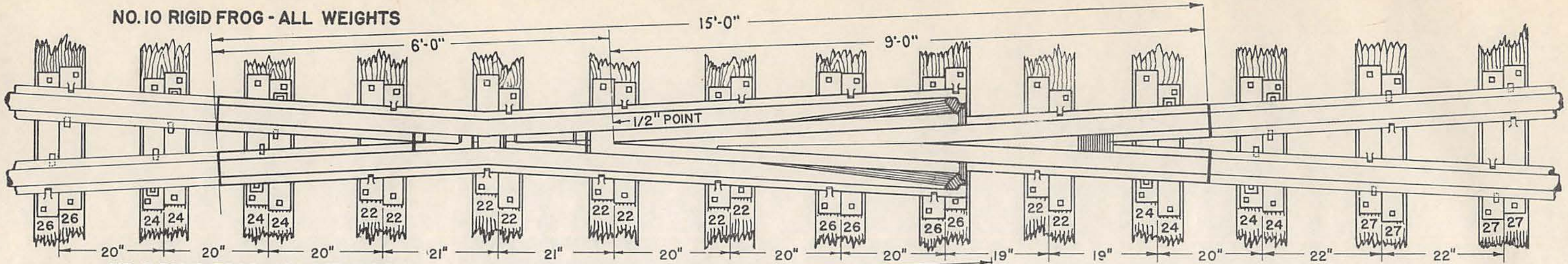
SWITCH STAND CONNECTING ROD AND CONNECTING ROD BOLT

Office of Chief Engineer Maintenance
Baltimore, Md.
June 1, 1945

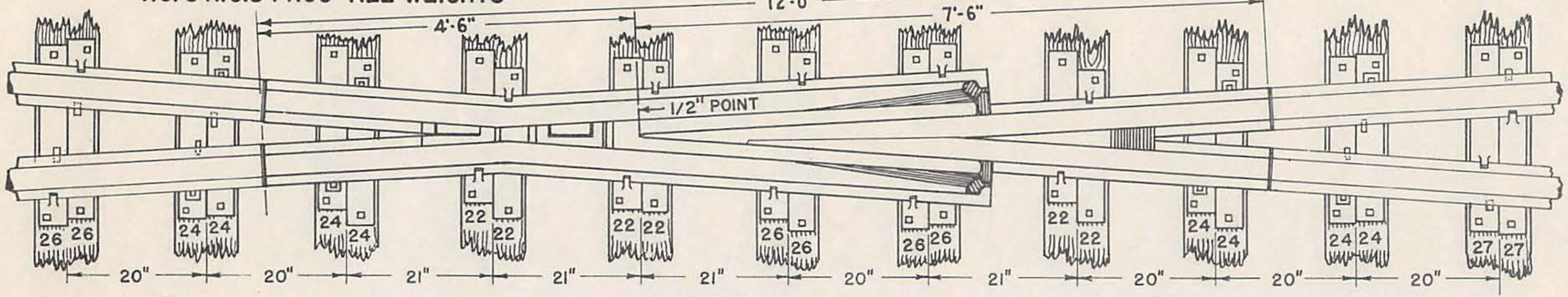
S.M.B.

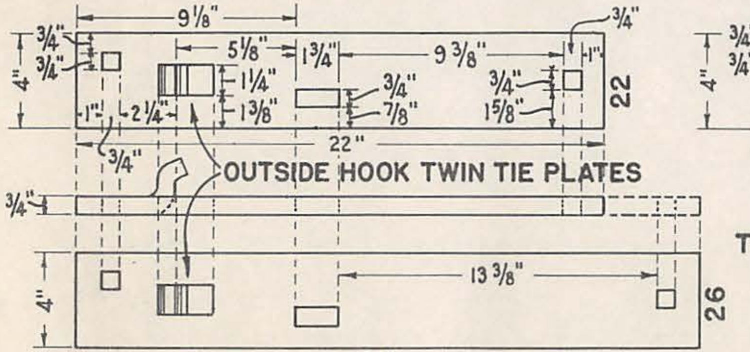
35483A
50J-18

NO. 10 RIGID FROG - ALL WEIGHTS

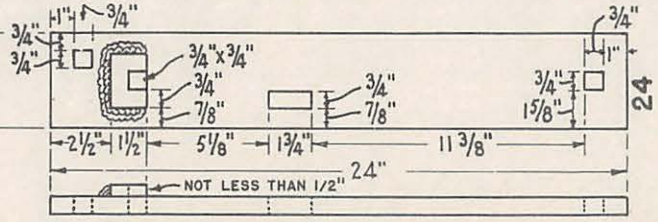

15'-0"
6'-0"
9'-0"
1/2" POINT
26 26
24 24
24 24
22 22
22 22
22 22
22 22
26 26
26 26
22 22
24 24
24 24
27 27
27 27
20"
20"
20"
21"
21"
20"
20"
20"
19"
19"
20"
22"
22"

NO. 8 RIGID FROG - ALL WEIGHTS

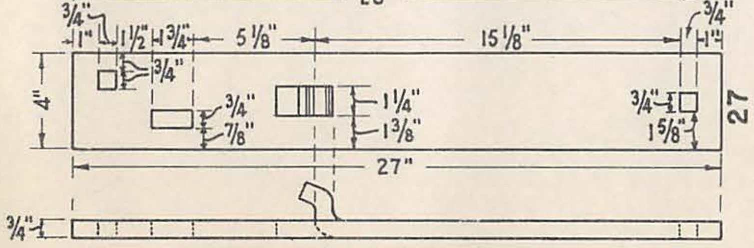

12'-0"
4'-6"
7'-6"
1/2" POINT
26 26
24 24
24 24
22 22
22 22
26 26
26 26
22 22
24 24
24 24
27 27
20"
20"
21"
21"
21"
20"
21"
20"
20"
20"


9 1/8"
3/4"
3/4"
3/4"
4"
5 1/8"
1 3/4"
9 3/8"
1"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
1"
2 1/4"
22
22"
3/4"
3/4"
13 3/8"
4"
26
26"

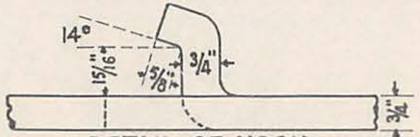
OUTSIDE HOOK TWIN TIE PLATES


3/4"
3/4"
1"
3/4"
4"
3/4"x3/4"
3/4"
7/8"
3/4"
7/8"
3/4"
1 5/8"
1"
24
2 1/2"
1 1/2"
5 1/8"
1 3/4"
11 3/8"
24"
NOT LESS THAN 1/2"

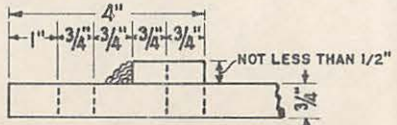
TWIN TIE PLATE WITH SHOULDER FOR USE AT JOINTS


3/4"
1"
1 1/2"
3/4"
5 1/8"
15 1/8"
3/4"
1"
4"
3/4"
3/4"
7/8"
1 1/4"
1 3/8"
3/4"
1 5/8"
27
27"
3/4"

INSIDE HOOK TWIN TIE PLATE


14°
15/16"
5/8"
3/4"
3/4"

DETAIL OF HOOK


4"
1"
3/4"
3/4"
3/4"
3/4"
NOT LESS THAN 1/2"
3/4"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE

PLATES REQUIRED FOR ONE FROG				
FROG NUMBER	LENGTH OF OR NUMBER OF PLATE			
	22"	24"	26"	27"
10	10	8	6	4
8	6	8	6	2

NOTE

PLATES TO BE MADE OF 3/4" X 4" ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

PLATES TO BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON DRAWING.

TWIN TIE FROG PLATES MAY BE ORDERED IN SETS, SPECIFYING THE NUMBER OF FROG AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES, SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

TOELESS TYPE OF JOINT BARS WILL BE REQUIRED AT HEEL AND TOE ENDS OF FROG WHEN TWIN TIE FROG PLATES ARE USED.

APPROVED- C.B. Harvey
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

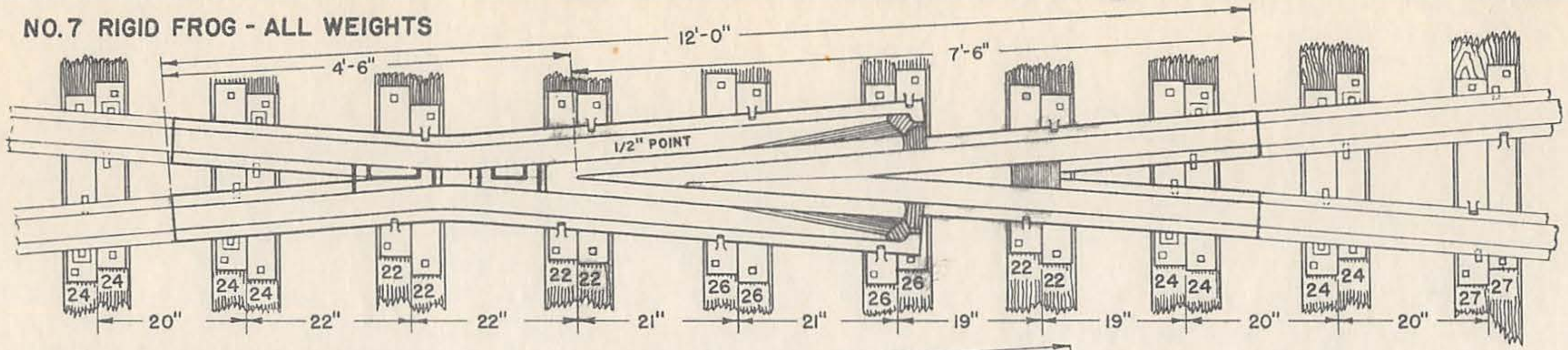
TWIN TIE PLATES
FOR RIGID FROGS NUMBERS 8 AND 10

Office of Chief Engineer Maintenance
Baltimore, Md.
July 20, 1945

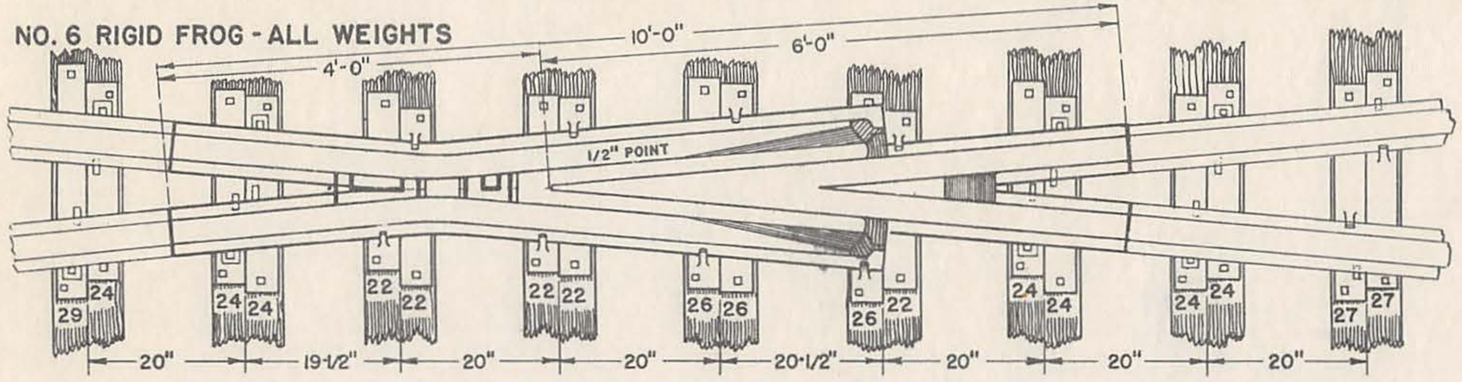
S.M.B.

35525
50J-21

NO.7 RIGID FROG - ALL WEIGHTS


12'-0"
4'-6"
7'-6"
1/2" POINT
24 24
24 24
22 22
22 22
26 26
26 26
22 22
24 24
24 24
27 27
20"
22"
22"
21"
21"
19"
19"
20"
20"

NO. 6 RIGID FROG - ALL WEIGHTS


10'-0"
4'-0"
6'-0"
1/2" POINT
29 24
24 24
22 22
22 22
26 26
26 22
24 24
24 24
27 27
20"
19-1/2"
20"
20"
20-1/2"
20"
20"
20"

NOTE

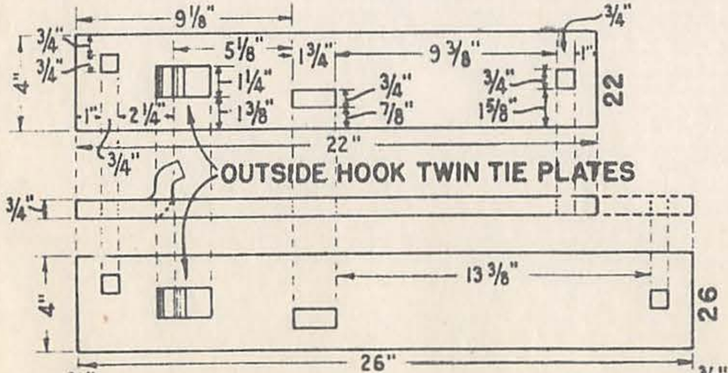
PLATES TO BE MADE OF 3/4" X 4" ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

PLATES TO BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON DRAWING.

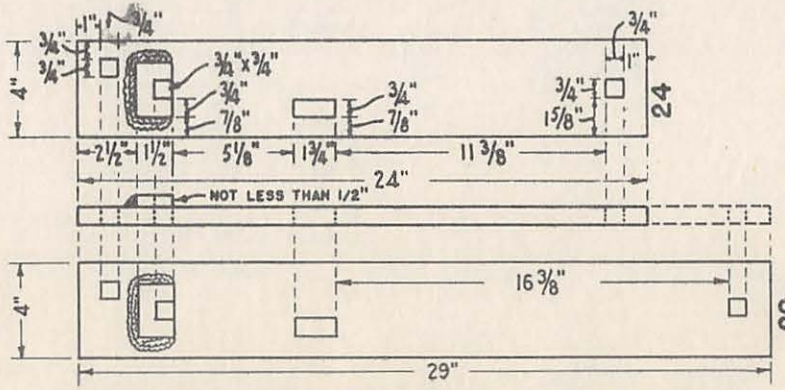
TWIN TIE FROG PLATES MAY BE ORDERED IN SETS, SPECIFYING THE NUMBER OF FROG AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES, SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

TOELESS TYPE OF JOINT BARS WILL BE REQURED AT HEEL AND TOE ENDS OF FROG WHEN TWIN TIE FROG PLATES ARE USED.

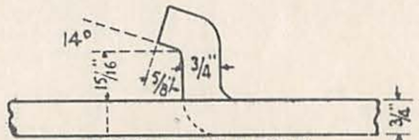
PLATES REQUIRED FOR ONE FROG					
FROG NUMBER	LENGTH OF OR NUMBER OF PLATE				
	22"	24"	26"	27"	29"
7	6	8	4	2	0
6	5	7	3	2	1


9 1/8"
5 1/8"
1 3/4"
9 3/8"
3/4"
1"
3/4"
3/4"
4"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
22
1"
2 1/4"
22"
3/4"
13 3/8"
26
26"

OUTSIDE HOOK TWIN TIE PLATES


1"
3/4"
3/4"
3/4"
3/4"
3/4"x3/4"
3/4"
7/8"
3/4"
7/8"
3/4"
1 5/8"
1"
4"
24
2 1/2"
1 1/2"
5 1/8"
1 3/4"
11 3/8"
24"
NOT LESS THAN 1/2"
16 3/8"
29
29"

TWIN TIE PLATES WITH SHOULDER FOR USE AT JOINTS

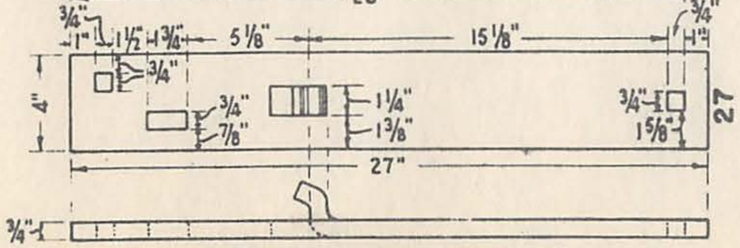

14°
15/16"
5/8"
3/4"
3/4"

DETAIL OF HOOK

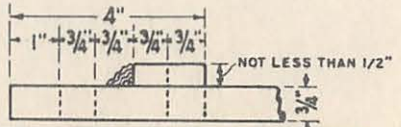
APPROVED- Chief Engineer Maintenance

APPROVED- ACClarke Chief Engineer

APPROVED- CWVanHorn Vice President, Operation & Maintenance


3/4"
1"
1 1/2"
1 3/4"
5 1/8"
15 1/8"
3/4"
1"
3/4"
4"
3/4"
7/8"
1 1/4"
1 3/8"
3/4"
1 5/8"
27
27"

INSIDE HOOK TWIN TIE PLATE


4"
1"
3/4"
3/4"
3/4"
3/4"
NOT LESS THAN 1/2"
3/4"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE

BALTIMORE & OHIO RAILROAD

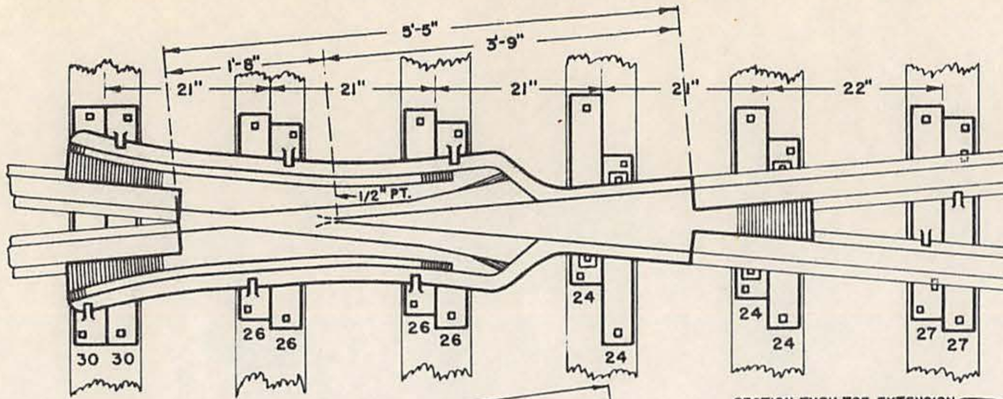
TWIN TIE PLATES
FOR RIGID FROGS NUMBERS 6 AND 7

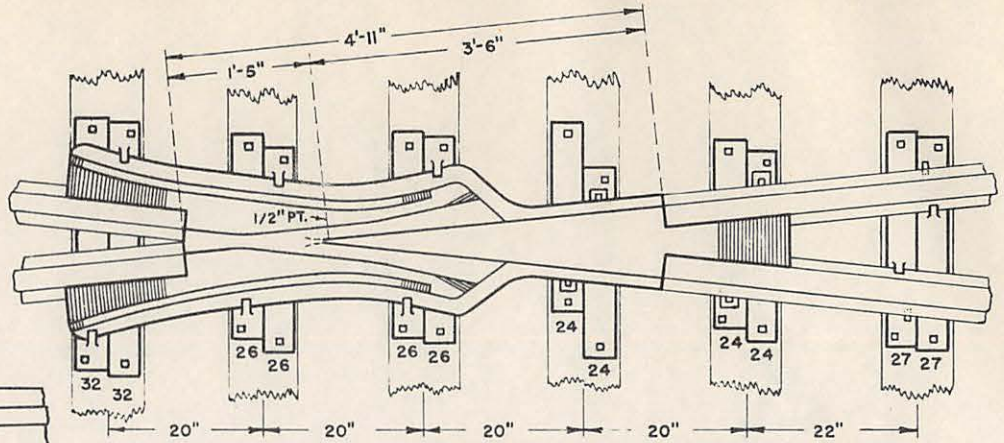
Office of Chief Engineer Maintenance
Baltimore, Md.
July 20, 1945

S.M.B.

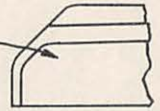
35553
50J-22

NO. 6 - RAILS 100 LB. AND LESS

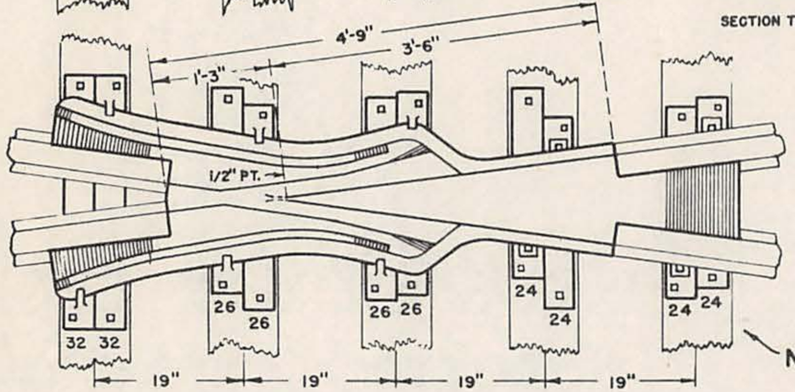

5'-5"
3'-9"
1'-8"
21"
21"
21"
21"
22"
1/2" PT.
30 30
26 26
26 26
24
24
24 24
27 27


4'-11"
3'-6"
1'-5"
1/2" PT.
32 32
26 26
26 26
24
24
24 24
27 27
20"
20"
20"
20"
22"

NO. 5 - RAILS 100 LB. AND LESS



SECTION THRU TOE EXTENSION


4'-9"
3'-6"
1'-3"
1/2" PT.
32 32
26 26
26 26
24
24
24 24
19"
19"
19"
19"

NO. 4 - RAILS 100 LB. AND LESS

PLATES REQUIRED FOR ONE FROG					
FROG NUMBER	LENGTH OF OR NUMBER OF PLATE				
	24"	26"	27"	30"	32"
6	4	4	2	2	-
5	4	4	2	-	2
4	4	4	-	-	2

NOTE

FROGS TO BE MADE TO A.R.E.A. STANDARD PLANS AND SPECIFICATIONS EXCEPT AS NOTED ON THIS PLAN.

HEEL & TOE EXTENSIONS WILL BE LONG ENOUGH TO SUIT JOINT DRILLING SPECIFIED EXCEPT WITH 112# & 131# SIX HOLE RAIL THE 3RD HOLE WILL BE DISREGARDED & 4 HOLE DRILLING PROVIDED.

BOLTS AT HEEL AND TOE ENDS WILL BE AS PER B&O PLANS & SPECIFICATIONS FOR "FROG & CROSSING BOLTS" AND "HEEL & TOE BLOCK BOLTS", WITH LENGTHS TO SUIT.

TWIN TIE FROG PLATES WILL BE MADE OF ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

PLATES WILL BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON PLAN.

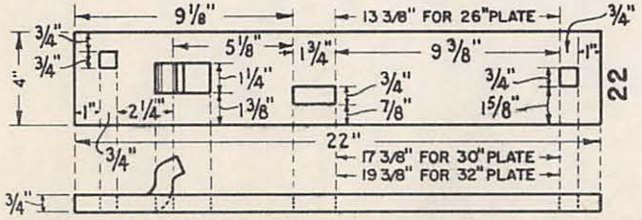
PLATES MAY BE ORDERED IN SETS, SPECIFYING THE FROG NUMBER AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

PLATES WILL BE ORDERED AS A SEPARATE ITEM ON REQUISITION.

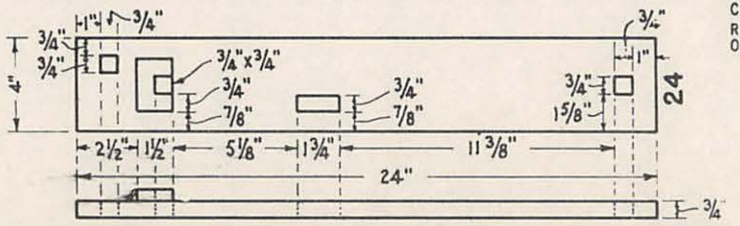
TOELESS TYPE OF JOINT BARS FURNISHED BY THE RAILROAD WILL BE USED AT HEEL END OF FROG.

RAIL SECTIONS WHERE BASE OF RAILS WILL NOT CLEAR AT EITHER THE HEEL OR TOE END, WILL HAVE CORNER OF RAIL BASE CUT OFF IN FIELD TO PROVIDE NECESSARY CLEARANCE.

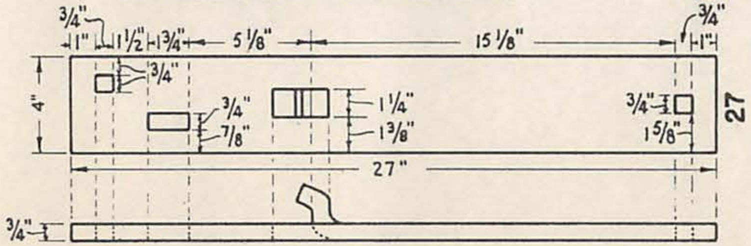
REQUISITIONS FOR FROGS WILL SPECIFY THE FROG NUMBER, TYPE, WEIGHT, SECTION, AND DRILLING OF CONNECTING RAILS, PLAN NUMBER AND A.R.E.A. SPECIFICATIONS.


9 1/8"
13 3/8" FOR 26" PLATE
3/4"
3/4"
3/4"
4"
5 1/8"
1 3/4"
9 3/8"
1"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
1"
2 1/4"
22
3/4"
22"
17 3/8" FOR 30" PLATE
19 3/8" FOR 32" PLATE
3/4"

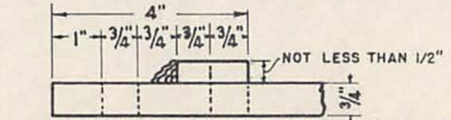
OUTSIDE HOOK TWIN TIE PLATE


1"
3/4"
3/4"
3/4"
4"
3/4"x3/4"
3/4"
7/8"
3/4"
7/8"
3/4"
1 5/8"
1"
24
2 1/2"
1 1/2"
5 1/8"
1 3/4"
11 3/8"
24"
3/4"

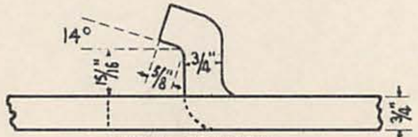
TWIN TIE PLATE WITH SHOULDER FOR USE AT JOINTS


3/4"
1"
1 1/2"
1 3/4"
5 1/8"
15 1/8"
3/4"
1"
3/4"
4"
3/4"
7/8"
1 1/4"
1 3/8"
3/4"
1 5/8"
27
27"
3/4"

INSIDE HOOK TWIN TIE PLATE


4"
1"
3/4"
3/4"
3/4"
3/4"
NOT LESS THAN 1/2"
3/4"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE


14°
15/16"
5/8"
3/4"
3/4"

DETAIL OF HOOK

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

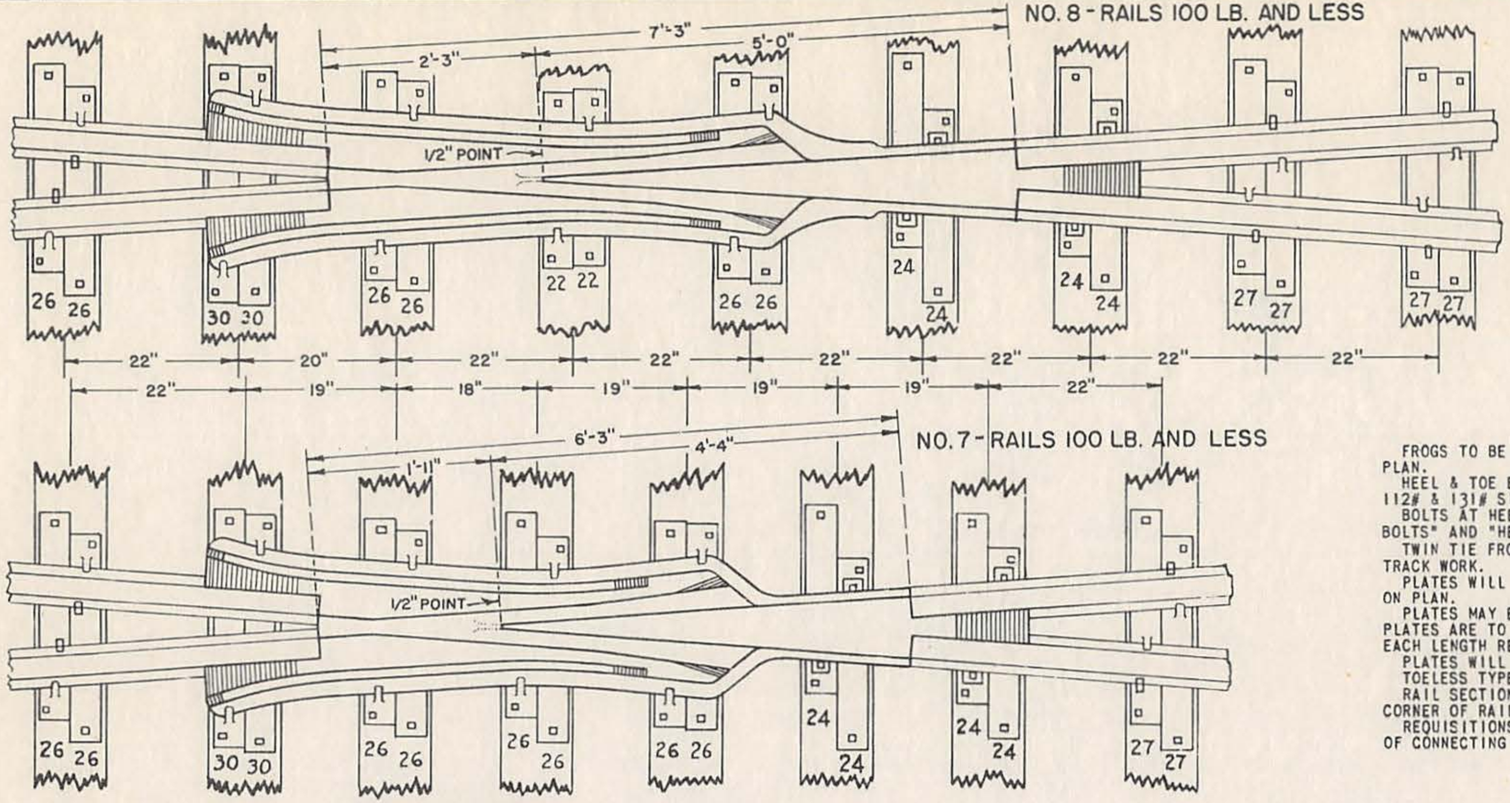
APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

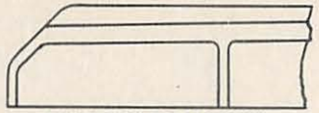
SELF GUARDED SOLID MANGANESE STEEL FROGS NOS. 4, 5 & 6 WITH TWIN TIE PLATES RAILS 100 LB. AND LESS

Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 9, 1945

35638
50J-30


NO. 8 - RAILS 100 LB. AND LESS
7'-3"
5'-0"
2'-3"
1/2" POINT
26 26
30 30
22 22
24
27 27
22"
20"
19"
18"
NO. 7 - RAILS 100 LB. AND LESS
6'-3"
4'-4"
1'-11"

FROG NO.	PLATE REQUIRED FOR ONE FROG				
	LENGTH OF OR NUMBER OF PLATE				
	22"	24"	26"	27"	30"
8	2	4	6	4	2
7	-	4	8	2	2



SECTION THRU TOE EXTENSION

NOTE

FROGS TO BE MADE TO A.R.E.A. STANDARD PLANS AND SPECIFICATIONS EXCEPT AS NOTED ON THIS PLAN.

HEEL & TOE EXTENSIONS WILL BE LONG ENOUGH TO SUIT JOINT DRILLING SPECIFIED EXCEPT WITH 112# & 131# SIX HOLE RAIL THE 3RD HOLE WILL BE DISREGARDED & 4 HOLE DRILLING PROVIDED.

BOLTS AT HEEL AND TOE ENDS WILL BE AS PER B&O PLANS & SPECIFICATIONS FOR "FROG & CROSSING BOLTS" AND "HEEL & TOE BLOCK BOLTS", WITH LENGTHS TO SUIT.

TWIN TIE FROG PLATES WILL BE MADE OF ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

PLATES WILL BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON PLAN.

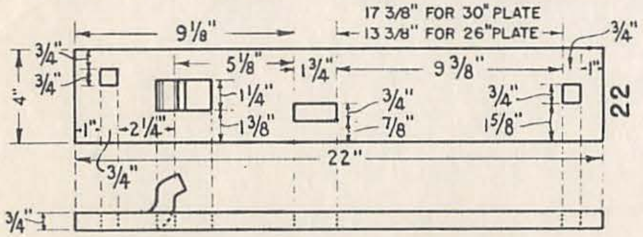
PLATES MAY BE ORDERED IN SETS, SPECIFYING THE FROG NUMBER AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

PLATES WILL BE ORDERED AS A SEPARATE ITEM ON REQUISITION.

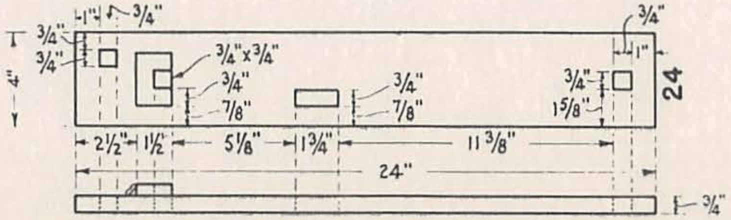
TOELESS TYPE OF JOINT BARS FURNISHED BY THE RAILROAD WILL BE USED AT HEEL END OF FROG.

RAIL SECTIONS WHERE BASE OF RAILS WILL NOT CLEAR AT EITHER THE HEEL OR TOE END, WILL HAVE CORNER OF RAIL BASE CUT OFF IN FIELD TO PROVIDE NECESSARY CLEARANCE.

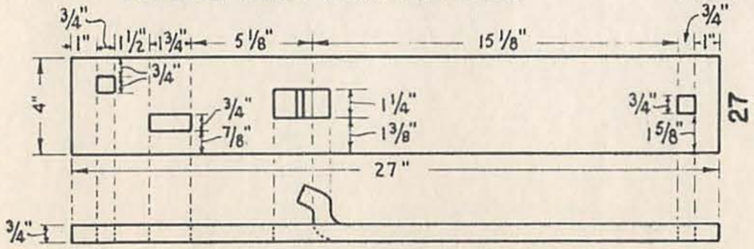
REQUISITIONS FOR FROGS WILL SPECIFY THE FROG NUMBER, TYPE, WEIGHT, SECTION, AND DRILLING OF CONNECTING RAILS, PLAN NUMBER AND A.R.E.A. SPECIFICATIONS.


17 3/8" FOR 30" PLATE
13 3/8" FOR 26" PLATE
9 1/8"
5 1/8"
1 3/4"
9 3/8"
3/4"
4"
1 1/4"
1 3/8"
2 1/4"
7/8"
1 5/8"
1"
22"
22

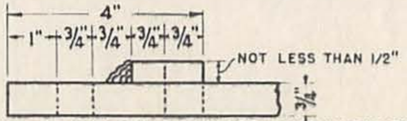
OUTSIDE HOOK TWIN TIE PLATE


3/4"x3/4"
3/4"
7/8"
1 5/8"
1"
4"
2 1/2"
1 1/2"
5 1/8"
1 3/4"
11 3/8"
24"
24

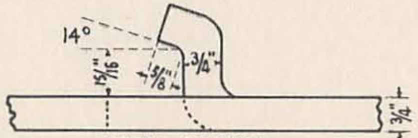
TWIN TIE PLATE WITH SHOULDER FOR USE AT JOINTS


3/4"
1"
1 1/2"
1 3/4"
5 1/8"
15 1/8"
4"
1 1/4"
1 3/8"
7/8"
1 5/8"
27"
27

INSIDE HOOK TWIN TIE PLATE


4"
1"
3/4"
NOT LESS THAN 1/2"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE


14°
15/16"
5/8"
3/4"

DETAIL OF HOOK

APPROVED-
Chief Engineer Maintenance

APPROVED- A.C.Clarke
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

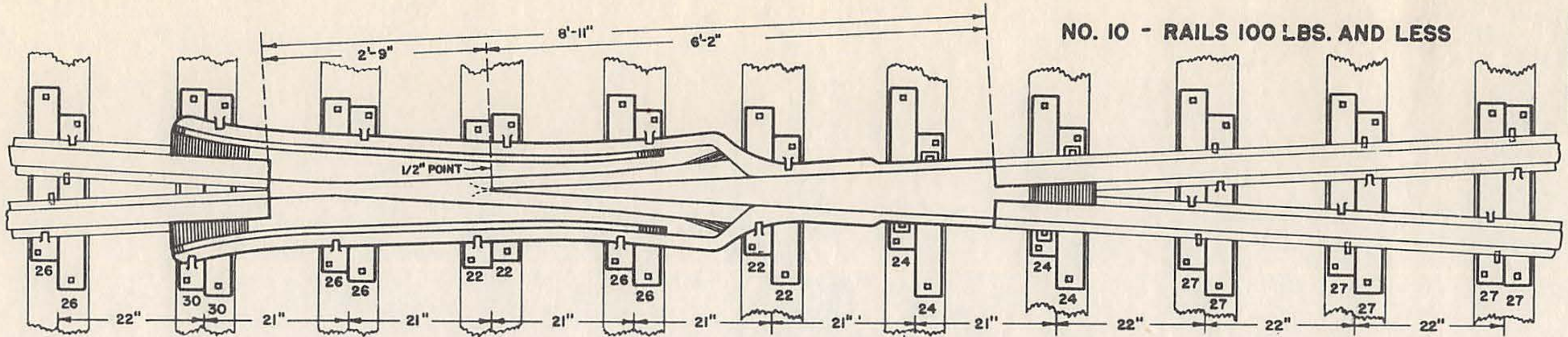
SELF GUARDED SOLID MANGANESE STEEL FROGS
NOS. 7 AND 8 WITH TWIN TIE PLATES
RAILS 100 LB. AND LESS

Office of Chief Engineer Maintenance
Baltimore, Md.
Nov. 12, 1945

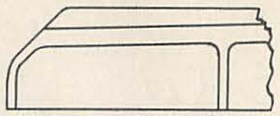
35639

50J-31

NO. 10 - RAILS 100 LBS. AND LESS

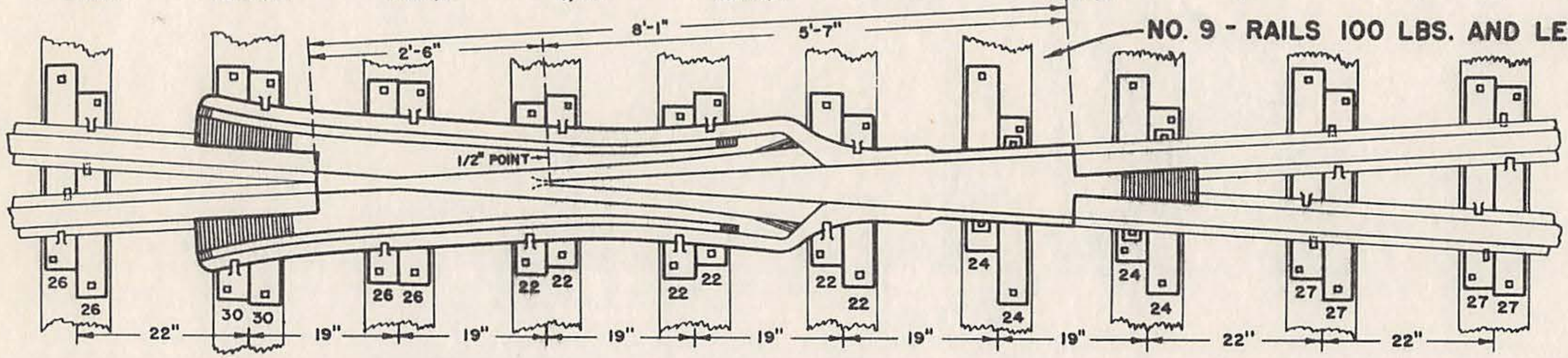

8'-11"
2'-9"
6'-2"
1/2" POINT
26
26
26
30
30
26
26
22
22
26
26
22
22
24
24
24
24
27
27
27
27
27
27
22"
21"
21"
21"
21"
21"
21"
22"
22"
22"

PLATES REQUIRED FOR ONE FROG					
FROG NUMBER	LENGTH OF OR NUMBER OF PLATE				
	22"	24"	26"	27"	30"
10	4	4	6	6	2
9	6	4	4	4	2



SECTION THRU TOE EXTENSION

NO. 9 - RAILS 100 LBS. AND LESS


8'-1"
2'-6"
5'-7"
1/2" POINT
26
26
26
30
30
26
26
22
22
22
22
22
22
24
24
24
24
27
27
27
27
22"
19"
19"
19"
19"
19"
19"
22"
22"

NOTE

FROGS TO BE MADE TO A.R.E.A. STANDARD PLANS AND SPECIFICATIONS EXCEPT AS NOTED ON THIS PLAN.

HEEL & TOE EXTENSIONS WILL BE LONG ENOUGH TO SUIT JOINT DRILLING SPECIFIED EXCEPT WITH 112# & 131# SIX HOLE RAIL THE 3RD HOLE WILL BE DISREGARDED & 4 HOLE DRILLING PROVIDED.

BOLTS AT HEEL AND TOE ENDS WILL BE AS PER B&O PLANS & SPECIFICATIONS FOR "FROG & CROSSING BOLTS" AND "HEEL & TOE BLOCK BOLTS", WITH LENGTHS TO SUIT.

TWIN TIE FROG PLATES WILL BE MADE OF ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

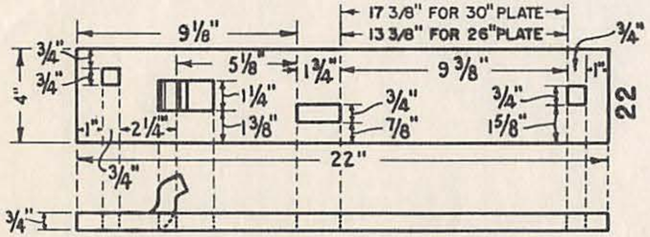
PLATES WILL BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON PLAN.

PLATES MAY BE ORDERED IN SETS, SPECIFYING THE FROG NUMBER AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED. PLATES WILL BE ORDERED AS A SEPARATE ITEM ON REQUISITION.

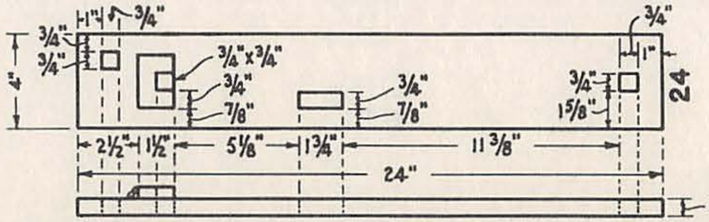
TOELESS TYPE OF JOINT BARS FURNISHED BY THE RAILROAD WILL BE USED AT HEEL END OF FROG.

RAIL SECTIONS WHERE BASE OF RAILS WILL NOT CLEAR AT EITHER THE HEEL OR TOE END, WILL HAVE CORNER OF RAIL BASE CUT OFF IN FIELD TO PROVIDE NECESSARY CLEARANCE.

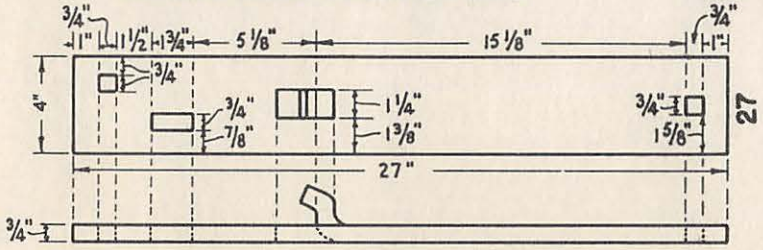
REQUISITIONS FOR FROGS WILL SPECIFY THE FROG NUMBER, TYPE, WEIGHT, SECTION, AND DRILLING OF CONNECTING RAILS, PLAN NUMBER AND A.R.E.A. SPECIFICATIONS.


17 3/8" FOR 30" PLATE
13 3/8" FOR 26" PLATE
9 1/8"
5 1/8"
1 3/4"
9 3/8"
3/4"
3/4"
3/4"
4"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
1"
1"
2 1/4"
3/4"
22"
22
3/4"

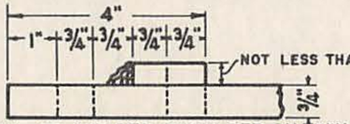
OUTSIDE HOOK TWIN TIE PLATE


1"
3/4"
3/4"
3/4"
4"
3/4"x3/4"
3/4"
7/8"
3/4"
7/8"
3/4"
1"
3/4"
1 5/8"
24
2 1/2"
1 1/2"
5 1/8"
1 3/4"
11 3/8"
24"
3/4"

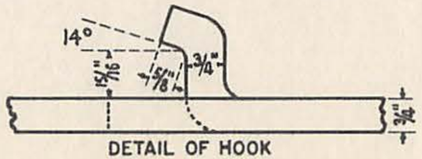
TWIN TIE PLATE WITH SHOULDER FOR USE AT JOINTS


3/4"
1"
1 1/2"
1 3/4"
5 1/8"
15 1/8"
3/4"
1"
4"
3/4"
3/4"
7/8"
1 1/4"
1 3/8"
3/4"
1 5/8"
27
27"
3/4"

INSIDE HOOK TWIN TIE PLATE


4"
1"
3/4"
3/4"
3/4"
3/4"
NOT LESS THAN 1/2"
3/4"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE


14°
15/16"
5/8"
3/4"
3/4"

DETAIL OF HOOK

APPROVED- C.B.Harrison
Chief Engineer Maintenance

APPROVED- A.C.Clarke
Chief Engineer

APPROVED- C.W.Van Horn
Vice President, Operation & Maintenance

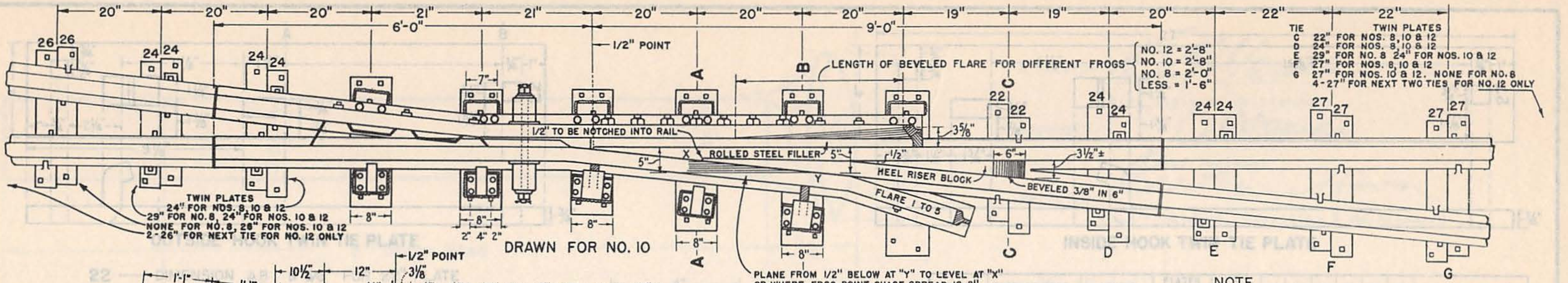
BALTIMORE & OHIO RAILROAD

SELF GUARDED SOLID MANGANESE STEEL FROGS NOS. 9 AND 10 WITH TWIN TIE PLATES RAILS 100 LB. AND LESS

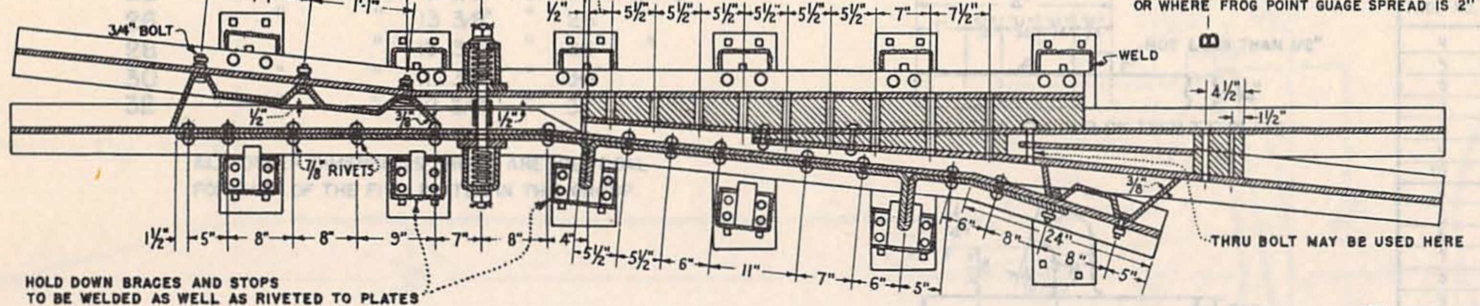
Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 9, 1945

S.M.B.

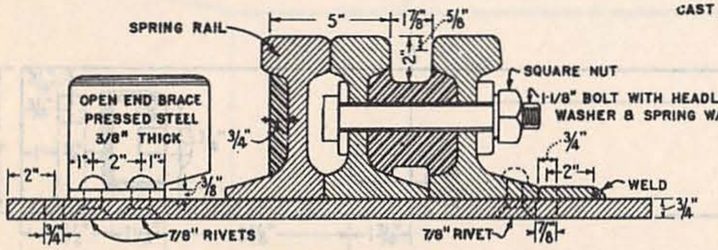
35640
50J-32


20"
20"
20"
21"
21"
20"
20"
20"
19"
19"
20"
22"
22"
6'-0"
9'-0"
1/2" POINT
LENGTH OF BEVELED FLARE FOR DIFFERENT FROGS
NO. 12 = 2'-8"
NO. 10 = 2'-8"
NO. 8 = 2'-0"
LESS = 1'-6"
TIE
TWIN PLATES
C 22" FOR NOS. 8, 10 & 12
D 24" FOR NOS. 8, 10 & 12
E 29" FOR NO. 8 24" FOR NOS. 10 & 12
F 27" FOR NOS. 8, 10 & 12
G 27" FOR NOS. 10 & 12. NONE FOR NO. 8
4-27" FOR NEXT TWO TIES FOR NO. 12 ONLY
26 26
24 24
24 24
22 22
24 24
24 24
27 27
27 27
-7"-
1/2" TO BE NOTCHED INTO RAIL
ROLLED STEEL FILLER
5"
5"
1/2"
3 5/8"
6"
3 1/2"±
X
Y
HEEL RISER BLOCK
BEVELED 3/8" IN 6"
FLARE 1 TO 5
TWIN PLATES
24" FOR NOS. 8, 10 & 12
29" FOR NO. 8, 24" FOR NOS. 10 & 12
NONE FOR NO. 8, 26" FOR NOS. 10 & 12
2-26" FOR NEXT TIE FOR NO. 12 ONLY
8"
8"
8"
8"
2" 4" 2"
A
B
C
D
E
F
G
PLANE FROM 1/2" BELOW AT "Y" TO LEVEL AT "X"
OR WHERE FROG POINT GUAGE SPREAD IS 2"

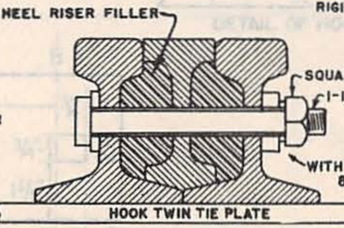
DRAWN FOR NO. 10


1/2" POINT
1'-1"
1'-1"
10 1/2"
12"
1/2"
3 1/8"
5 1/2"
5 1/2"
5 1/2"
5 1/2"
5 1/2"
5 1/2"
7"
7 1/2"
3/4" BOLT
1/2"
3/8"
1/2"
7/8" RIVETS
WELD
4 1/2"
1 1/2"
3/8"
THRU BOLT MAY BE USED HERE
1 1/2"
5"
8"
8"
9"
7"
8"
4"
5 1/2"
5 1/2"
6"
11"
7"
6"
5"
6"
8"
24"
8"
5"

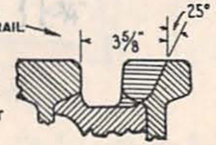
HOLD DOWN BRACES AND STOPS
TO BE WELDED AS WELL AS RIVETED TO PLATES

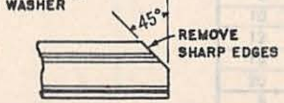

SPRING RAIL
5"
1 7/8"
5/8"
2"
SQUARE NUT
1-1/8" BOLT WITH HEADLOCK, WASHER & SPRING WASHER
OPEN END BRACE PRESSED STEEL 3/8" THICK
3/4"
3/4"
2"
1"
2"
1"
3/8"
2"
WELD
3/4"
3/4"
7/8" RIVETS
7/8" RIVET
1 7/8"

SECTION A-A

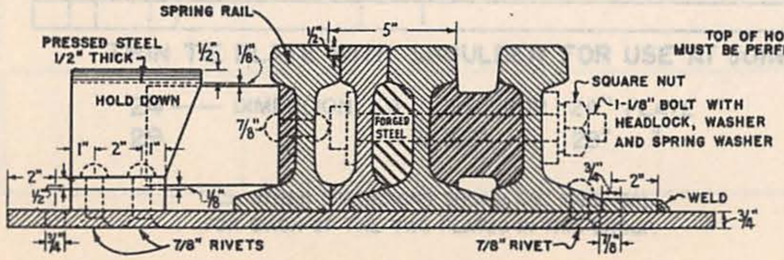

CAST IRON HEEL RISER FILLER
SQUARE NUT
1-1/8" BOLT
WITH HEADLOCK, WASHER & SPRING WASHER
HOOK TWIN TIE PLATE

SECTION C-C

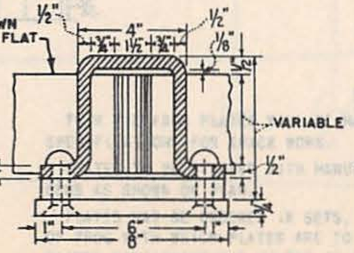

END VIEW RIGID WING RAIL
3 5/8"
25°


45°
REMOVE SHARP EDGES

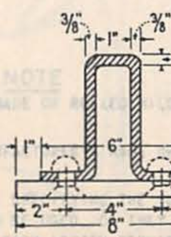
SIDE VIEW OF BEVELED WING RAILS


SPRING RAIL
PRESSED STEEL 1/2" THICK
HOLD DOWN
1/2"
5"
1/2"
1/8"
7/8"
7/8"
FORGED STEEL
SQUARE NUT
1-1/8" BOLT WITH HEADLOCK, WASHER AND SPRING WASHER
1"
2"
1"
2"
1/2"
1/8"
3/8"
2"
WELD
3/4"
3/4"
7/8" RIVETS
7/8" RIVET
1 7/8"

SECTION B-B


TOP OF HOLD DOWN MUST BE PERFECTLY FLAT
1/2"
4"
1/2"
3/4"
1 1/2"
3/4"
1/8"
VARIABLE
1/2"
1/2"
1"
6"
8"

SECTION OF HOLD DOWN


3/8"
1"
3/8"
3/8"
1"
6"
1"
3/8"
3/4"
2"
4"
2"
8"

SECTION OF STOP

NOTE

THIS PLAN SHOWS CONSTRUCTION OF NO. 10 FROG FOR ALL WEIGHTS OF RAIL, FROGS OF OTHER NUMBERS TO BE OF SAME LENGTH BUT WITH DETAILS CHANGED WHEN NECESSARY.

FROGS TO CONFORM TO A.R.E.A. SPECIFICATIONS EXCEPT FOR DETAILS SHOWN ON THIS PLAN.

RAIL USED IN THE MANUFACTURE OF FROGS TO CONFORM TO SPECIFICATIONS FOR NEW RAIL.

ALL THROUGH BOLTS TO BE 1-1/8" DIAMETER AND SHALL CONFORM TO B&ORR PLANS AND SPECIFICATIONS FOR FROG AND CROSSING BOLTS, EXCEPT BOLTS FOR 67# AND LIGHTER TO BE 1" DIAMETER IN ORDER TO PROVIDE FOR PROPER DEPTH OF FLANGEWAY.

DEPTH OF FLANGEWAY FOR 67# RAIL AND LIGHTER TO BE 1-3/4" TO 1-7/8".

SPRING FROGS 100# SECTION AND OVER TO HAVE PROPER HOLE IN TOE END OF SPRING RAIL REAMED TO PROVIDE FOR PIPE THIMBLE. HOLES FOR 1" AND 1-1/16" BOLTS TO BE 1-9/16" DIAMETER, HOLES FOR 1-1/8" BOLTS TO BE 1-3/4" DIAMETER.

FOR DETAILS OF SPRINGS, HOUSINGS, BOLTS, ETC., SEE BASIC PLAN NOS. 25641, 25642, 30211.

FOR DETAILS OF TWIN TIE FROG PLATES SEE SPECIAL PLAN COVERING.

TWIN TIE FROG PLATES WILL BE ORDERED AS SEPARATE ITEM ON REQUISITION AND MAY BE ORDERED IN SETS, SPECIFYING THE NUMBER OF FROG AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

UNLESS OTHERWISE SPECIFIED HEEL BLOCKS AND TOE BLOCKS WITH BOLTS, PIPE THIMBLES AND BENT BARS WILL BE FURNISHED BY THE RAILROAD AS PER STANDARD PLANS AND SHOULD BE ORDERED AS A SEPARATE ITEM ON REQUISITION.

TOELESS TYPE OF JOINT BARS WILL BE REQUIRED AT HEEL AND TOE ENDS OF FROGS WHEN TWIN TIE FROG PLATES ARE USED.

REQUISITIONS FOR FROGS WILL SPECIFY THE FROG NUMBER, TYPE, WEIGHT, SECTION & DRILLING OF CONNECTING RAILS, PLAN NUMBER AND A.R.E.A. SPECIFICATIONS.

APPROVED- ______________ APPROVED- ______________
Chief Engineer Maintenance Chief Engineer

APPROVED- ______________
Vice President, Operation & Maintenance

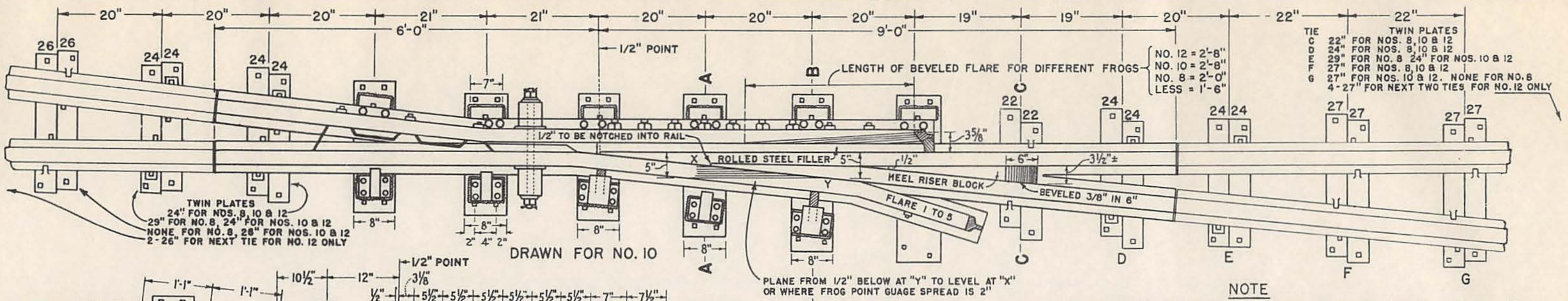
PLATES REQUIRED FOR ONE FROG

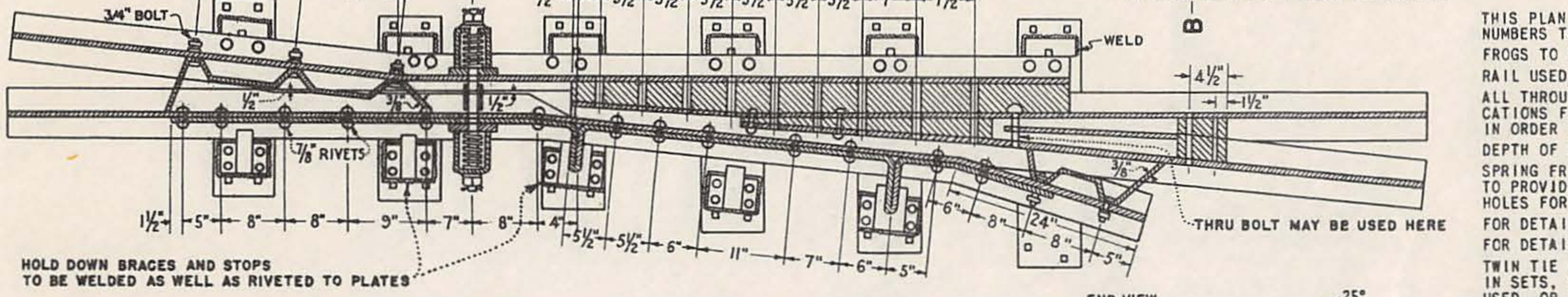
SPRING FROG NO.	LENGTH OF OR NO. OF PLATES				
	22"	24"	26"	27"	29"
8	2	4	-	2	4
10	2	8	2	4	-
12	2	8	4	8	-

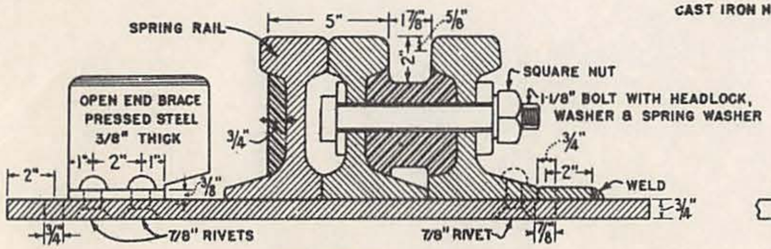
BALTIMORE & OHIO RAILROAD
SPRING RAIL FROG
Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 20, 1945

35644

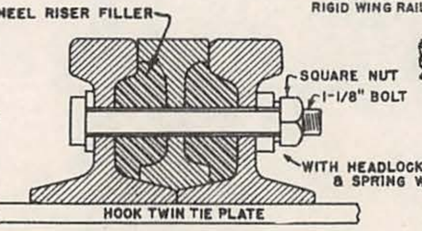
50J-36


20"
20"
20"
21"
21"
20"
20"
20"
19"
19"
20"
22"
22"
6'-0"
9'-0"
1/2" POINT
A
B
C
LENGTH OF BEVELED FLARE FOR DIFFERENT FROGS
NO. 12 = 2'-8"
NO. 10 = 2'-8"
NO. 8 = 2'-0"
LESS = 1'-6"
TIE
TWIN PLATES
C 22" FOR NOS. 8, 10 & 12
D 24" FOR NOS. 8, 10 & 12
E 29" FOR NO. 8 24" FOR NOS. 10 & 12
F 27" FOR NOS. 8, 10 & 12
G 27" FOR NOS. 10 & 12. NONE FOR NO. 8
4-27" FOR NEXT TWO TIES FOR NO. 12 ONLY
26 26
24 24
22 22
27 27
1/2" TO BE NOTCHED INTO RAIL
3⅝"
X
ROLLED STEEL FILLER
5"
1/2"
6"
3½"±
HEEL RISER BLOCK
BEVELED 3/8" IN 6"
Y
FLARE 1 TO 5
TWIN PLATES
24" FOR NOS. 8, 10 & 12
29" FOR NO. 8, 24" FOR NOS. 10 & 12
NONE FOR NO. 8, 26" FOR NOS. 10 & 12
2-26" FOR NEXT TIE FOR NO. 12 ONLY
8"
2" 4" 2"
DRAWN FOR NO. 10
PLANE FROM 1/2" BELOW AT "Y" TO LEVEL AT "X"
OR WHERE FROG POINT GUAGE SPREAD IS 2"
D
E
F
G

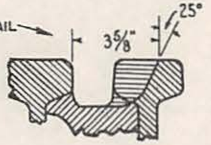

1/2" POINT
1'-1"
1'-1"
10½"
12"
3⅛"
5½"
7"
7½"
3/4" BOLT
1/2"
7/8" RIVETS
WELD
4½"
1½"
3/8"
THRU BOLT MAY BE USED HERE
24"
HOLD DOWN BRACES AND STOPS
TO BE WELDED AS WELL AS RIVETED TO PLATES

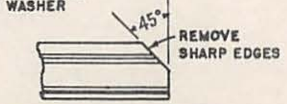

SPRING RAIL
5"
1⅞"
5/8"
SQUARE NUT
1-1/8" BOLT WITH HEADLOCK, WASHER & SPRING WASHER
OPEN END BRACE
PRESSED STEEL
3/8" THICK
3/4"
1" 2" 1"
2"
3/8"
WELD
7/8" RIVETS
7/8" RIVET
3/4"

SECTION A-A

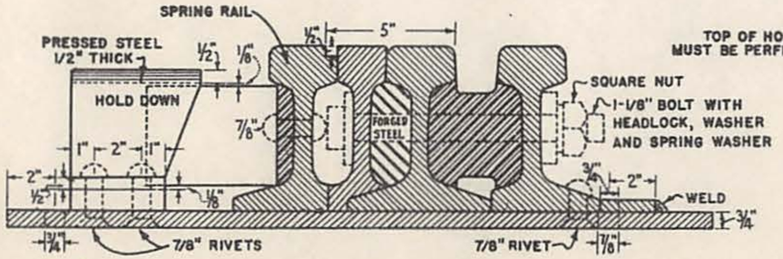

CAST IRON HEEL RISER FILLER
SQUARE NUT
1-1/8" BOLT
WITH HEADLOCK, WASHER & SPRING WASHER
HOOK TWIN TIE PLATE

SECTION C-C

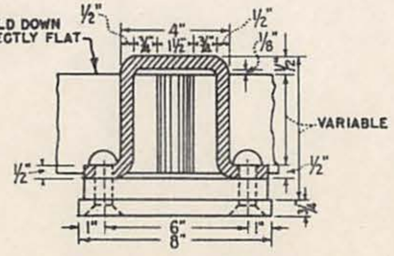

END VIEW
RIGID WING RAIL
3⅝"
25°


45°
REMOVE
SHARP EDGES

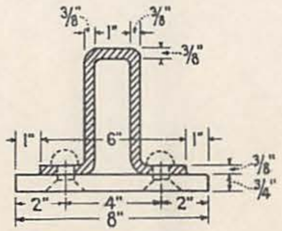
SIDE VIEW OF BEVELED WING RAILS


SPRING RAIL
PRESSED STEEL
1/2" THICK
HOLD DOWN
5"
1/2"
1/8"
7/8"
FORGED STEEL
SQUARE NUT
1-1/8" BOLT WITH HEADLOCK, WASHER AND SPRING WASHER
1" 2" 1"
2"
WELD
7/8" RIVETS
7/8" RIVET
3/4"

SECTION B-B


TOP OF HOLD DOWN
MUST BE PERFECTLY FLAT
1/2"
4"
VARIABLE
1"
6⅝"
1"

SECTION OF HOLD DOWN



SECTION OF STOP

NOTE

THIS PLAN SHOWS CONSTRUCTION OF NO. 10 FROG FOR ALL WEIGHTS OF RAIL. FROGS OF OTHER NUMBERS TO BE OF SAME LENGTH BUT WITH DETAILS CHANGED WHEN NECESSARY.

FROGS TO CONFORM TO A.R.E.A. SPECIFICATIONS EXCEPT FOR DETAILS SHOWN ON THIS PLAN.

RAIL USED IN THE MANUFACTURE OF FROGS TO CONFORM TO SPECIFICATIONS FOR NEW RAIL.

ALL THROUGH BOLTS TO BE 1-1/8" DIAMETER AND SHALL CONFORM TO B&ORR PLANS AND SPECIFICATIONS FOR FROG AND CROSSING BOLTS, EXCEPT BOLTS FOR 67# AND LIGHTER TO BE 1" DIAMETER IN ORDER TO PROVIDE FOR PROPER DEPTH OF FLANGEWAY.

DEPTH OF FLANGEWAY FOR 67# RAIL AND LIGHTER TO BE 1-3/4" TO 1-7/8".

SPRING FROGS 100# SECTION AND OVER TO HAVE PROPER HOLE IN TOE END OF SPRING RAIL REAMED TO PROVIDE FOR PIPE THIMBLE. HOLES FOR 1" AND 1-1/16" BOLTS TO BE 1-9/16" DIAMETER, HOLES FOR 1-1/8" BOLTS TO BE 1-3/4" DIAMETER.

FOR DETAILS OF SPRINGS, HOUSINGS, BOLTS, ETC., SEE BASIC PLAN NOS. 25641, 25642, 30211.

FOR DETAILS OF TWIN TIE FROG PLATES SEE SPECIAL PLAN COVERING.

TWIN TIE FROG PLATES WILL BE ORDERED AS SEPARATE ITEM ON REQUISITION AND MAY BE ORDERED IN SETS, SPECIFYING THE NUMBER OF FROG AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

UNLESS OTHERWISE SPECIFIED HEEL BLOCKS AND TOE BLOCKS WITH BOLTS, PIPE THIMBLES AND BENT BARS WILL BE FURNISHED BY THE RAILROAD AS PER STANDARD PLANS AND SHOULD BE ORDERED AS A SEPARATE ITEM ON REQUISITION.

TOELESS TYPE OF JOINT BARS WILL BE REQUIRED AT HEEL AND TOE ENDS OF FROGS WHEN TWIN TIE FROG PLATES ARE USED.

REQUISITIONS FOR FROGS WILL SPECIFY THE FROG NUMBER, TYPE, WEIGHT, SECTION & DRILLING OF CONNECTING RAILS, PLAN NUMBER AND A.R.E.A. SPECIFICATIONS.

APPROVED- CBHarrison
Chief Engineer Maintenance

APPROVED- ABClarke
Chief Engineer

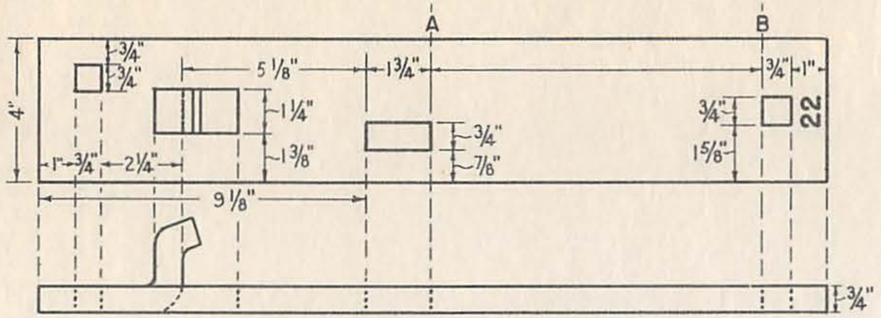
APPROVED- CWVanHorn
Vice President, Operation & Maintenance

PLATES REQUIRED FOR ONE FROG					
SPRING FROG NO.	LENGTH OF OR NO. OF PLATES				
	22"	24"	26"	27"	29"
8	2	4	-	2	4
10	2	8	2	4	-
12	2	8	4	8	-

BALTIMORE & OHIO RAILROAD
SPRING RAIL FROG
Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 20, 1945

35644

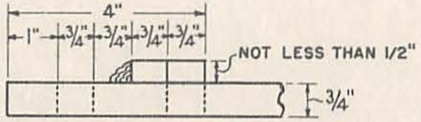
50J-36


A
B
3/4"
3/4"
5 1/8"
1 3/4"
3/4"
1"
4"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
22
1"
3/4"
2 1/4"
9 1/8"
3/4"

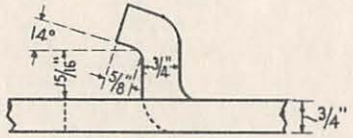
OUTSIDE HOOK TWIN TIE PLATE

22 —	DIMENSION	AB	9 3/8"	FOR	22"	PLATE
26	"	"	13 3/8"	"	26"	"
28	"	"	15 3/8"	"	28"	"
30	"	"	17 3/8"	"	30"	"
32	"	"	19 3/8"	"	32"	"

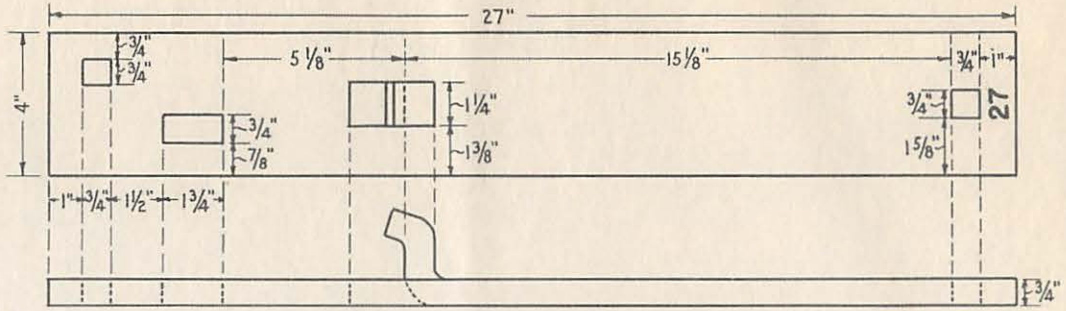
ALL OTHER DIMENSIONS SHOWN ARE IDENTICAL FOR EACH OF THE FIVE PLATES IN THIS GROUP.


4"
1"
3/4"
3/4"
3/4"
3/4"
NOT LESS THAN 1/2"
3/4"

DETAIL OF WELDED SHOULDER ON TWIN TIE PLATE

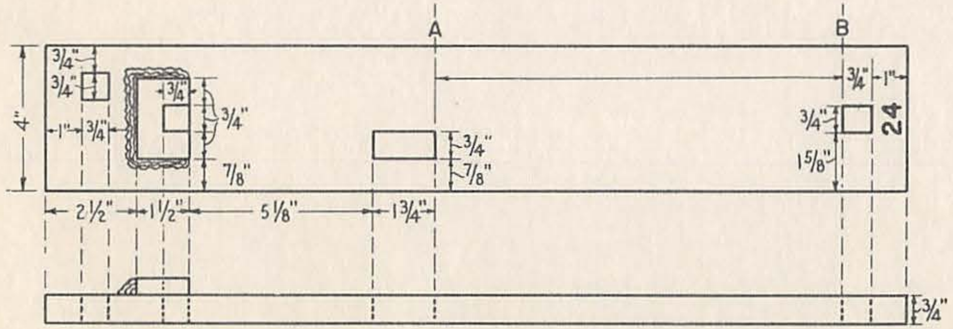

14°
5/16"
5/8"
3/4"
3/4"

DETAIL OF HOOK


27"
3/4"
3/4"
5 1/8"
15 1/8"
3/4"
1"
4"
1 1/4"
1 3/8"
3/4"
7/8"
3/4"
1 5/8"
27
1"
3/4"
1 1/2"
1 3/4"
3/4"

INSIDE HOOK TWIN TIE PLATE

FROG NO.	TYPE OF FROG	LENGTH	PLATES PER SET	22	24	26	27	28	29	30	32	RAIL WEIGHT
4	SELF GUARDED	4'9"	10		4	4					2	100 LB. AND LESS
5	"	4'11"	12		4	4	2				2	"
6	"	5'5"	12		4	4	2			2		"
7	"	6'3"	16		4	8	2			2		"
8	"	7'3"	18	2	4	6	4			2		"
9	"	8'1"	20	6	4	4	4			2		"
10	"	8'11"	22	4	4	6	6			2		"
4	SELF GUARDED	5'8"	10	2	4	2				2		OVER 100 LB.
5	"	6'5"	12	2	4	4					2	"
6	"	7'4"	18	2	4	6	4	2				"
7	"	8'1-1/2"	20	2	4	6	6	2				"
8	"	8'11"	22	4	4	8	4	2				"
9	"	9'9"	26	4	4	12	6					"
10	"	11'4-1/2"	28	8	4	8	6			2		"
6	RIGID	10'0"	18	5	7	3	2		1			ALL WEIGHTS
7	"	12'0"	20	6	8	4	2					"
8	"	12'0"	22	6	8	6	2					"
10	"	15'0"	28	10	8	6	4					"
5	RAIL BOUND	10'0"	16	4	4	2		2	4			ALL WEIGHTS
6	"	10'0"	18	2	7	4	2	2	1			"
7	"	12'0"	20	4	8	4	2	2				"
8	"	12'0"	22	4	8	8	2					"
10	"	15'0"	28	7	8	9	4					"
12	"	18'0"	34	10	8	10	6					"
16	"	23'0"	44	12	8	16	8					"
20	"	28'0"	56	14	8	22	12					"
8	SPRING	15'0"	12	2	4		2		4			ALL WEIGHTS
10	"	15'0"	16	2	8	2	4					"
12	"	15'0"	22	2	8	4	8					"


A
B
3/4"
3/4"
3/4"
3/4"
1"
3/4"
3/4"
7/8"
4"
3/4"
7/8"
3/4"
1"
3/4"
1 5/8"
24
2 1/2"
1 1/2"
5 1/8"
1 3/4"
3/4"

TWIN TIE PLATE WITH SHOULDER FOR USE AT JOINTS

24 —	DIMENSION	AB	11 3/8"	FOR	24"	PLATE
29	"	"	16 3/8"	"	29"	"

ALL OTHER DIMENSIONS SHOWN ARE IDENTICAL FOR EACH OF THE TWO PLATES IN THIS GROUP.

NOTE

TWIN TIE FROG PLATES WILL BE MADE OF ROLLED MILD STEEL AS PER A.R.E.A. SPECIFICATIONS FOR TRACK WORK.

PLATES TO BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK AND WITH NUMBERS AS SHOWN ON PLAN.

PLATES MAY BE ORDERED IN SETS, SPECIFYING THE NUMBER OF THE FROG AND TYPE OF FROG WITH WHICH PLATES ARE TO BE USED, OR THEY MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED, AND SHOULD BE ORDERED AS SEPARATE ITEM ON REQUISITION.

APPROVED- C.B. Harrison
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

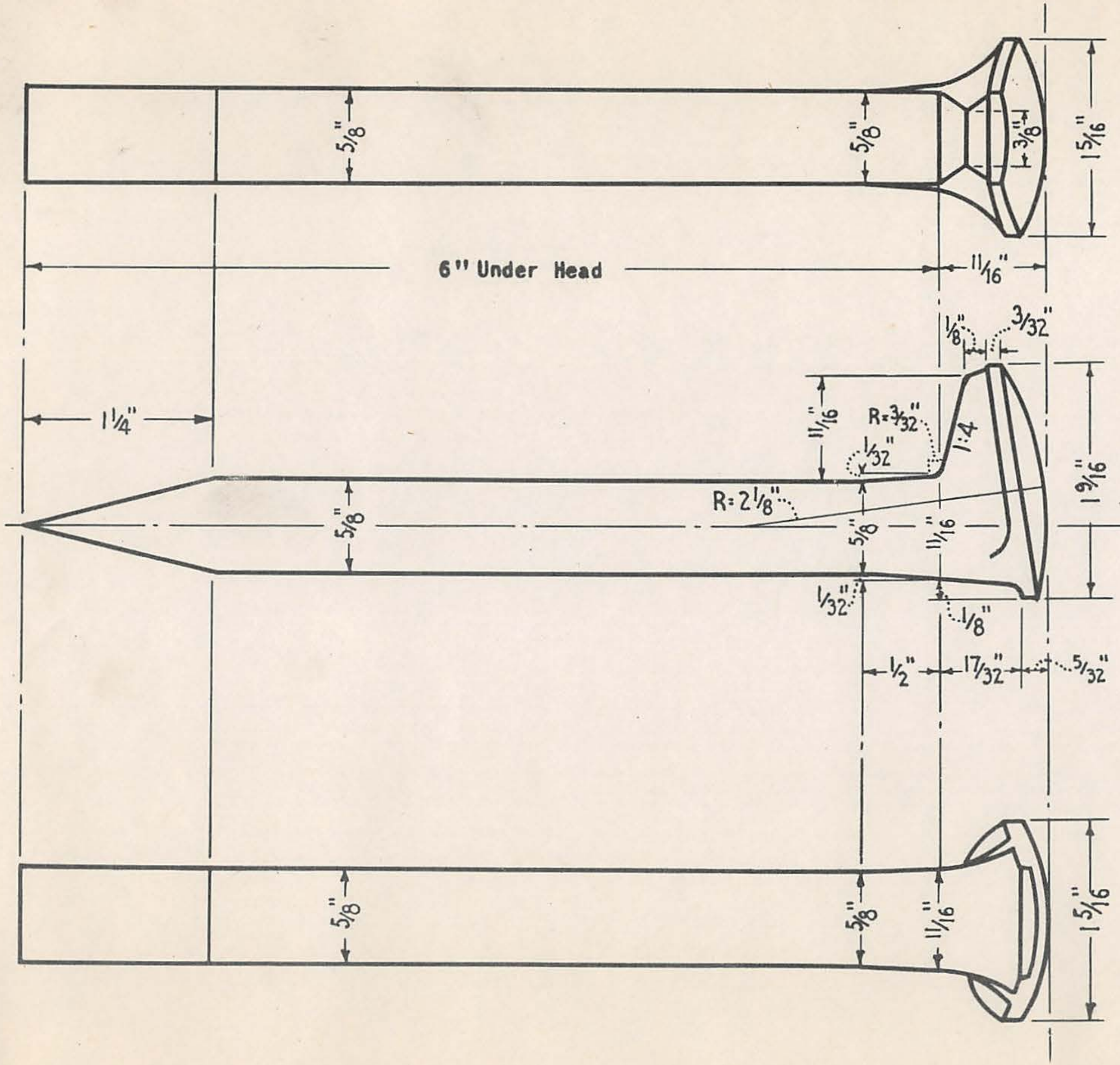
TWIN TIE PLATES FOR FROGS

Office of Chief Engineer Maintenance
Baltimore, Md.
Nov. 9, 1945

S.M.B.

35645

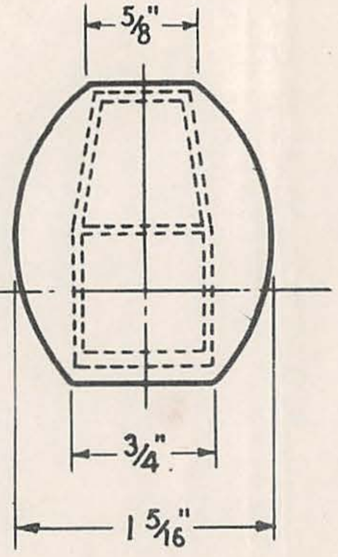
50J-37


5/8"
5/8"
3/8"
1 5/16"
6" Under Head
11/16"
1/8"
3/32"
11/16"
R=3/32"
1/32"
1:4
1 9/16"
1 1/4"
R=2 1/8"
5/8"
5/8"
11/16"
1/32"
1/8"
1/2"
17/32"
5/32"
5/8"
5/8"
11/16"
1 5/16"

APPROVED-
Chief Engineer Maintenance

APPROVED- A C Clarke
Chief Engineer

APPROVED- C W Van Horn
Vice President, Operation & Maintenance



NOTE

SPIKE AS SHOWN WILL BE USED WITH ALL RAIL SECTIONS.

B.& O.R.R. SPECIFICATIONS NO. 59, LATEST LETTER SUFFIX.

SPIKE IS A.R.E.A. STANDARD OF 1937.

BALTIMORE AND OHIO RAILROAD

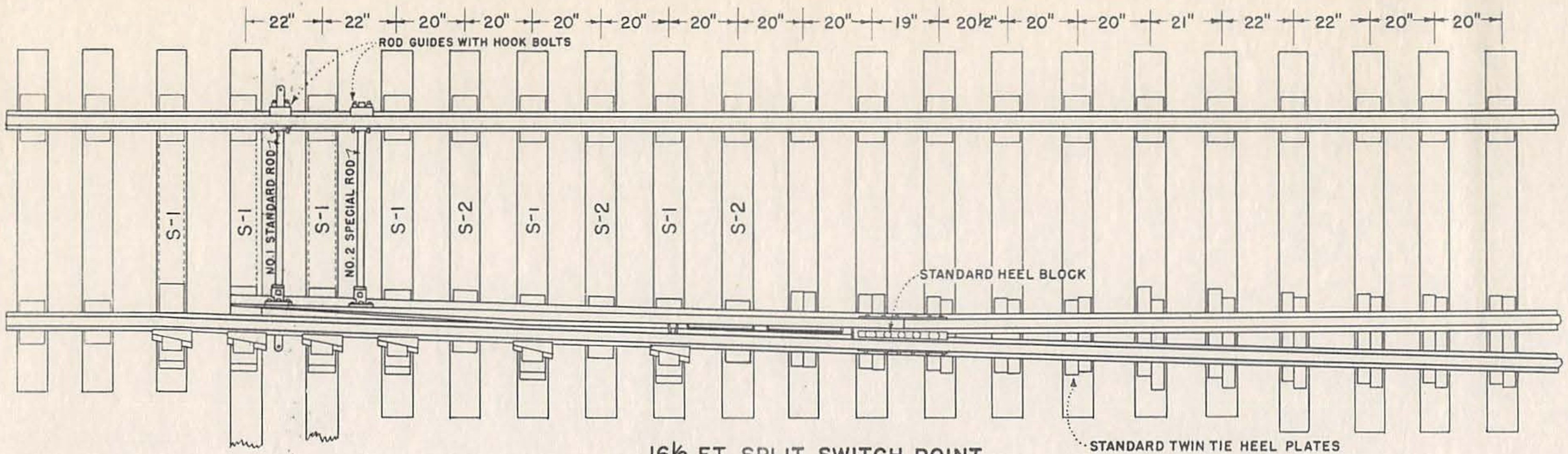
STANDARD STEEL TRACK SPIKE

Office of Chief Engineer Maintenance
Baltimore, Md.
Feb. 27, 1946

S.M.B.

35786

82 Q-11


22"
22"
20"
20"
20"
20"
20"
20"
20"
19"
20½"
20"
20"
21"
22"
22"
20"
20"
ROD GUIDES WITH HOOK BOLTS
S-1
S-1
NO.1 STANDARD ROD
S-1
NO.2 SPECIAL ROD
S-1
S-2
S-1
S-2
S-1
S-2
STANDARD HEEL BLOCK
STANDARD TWIN TIE HEEL PLATES

16½ FT. SPLIT SWITCH POINT

NOTE

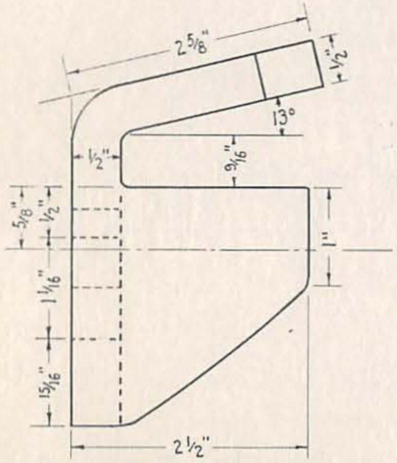
ROD MARKED NO.1 TO BE A STANDARD 1"x3" SWITCH ROD. NO.2 TO BE SPECIAL 1"x3" ROD, DETAILS OF WHICH ARE SHOWN. RODS WILL BE INSULATED WHEN SO ORDERED.

FOR INTERLOCKING CONNECTIONS SEE SIGNAL ENGINEERS PLAN 25-20-K.
ROD GUIDE TO BE MADE OF FORGED STEEL TO DIMENSIONS SHOWN.

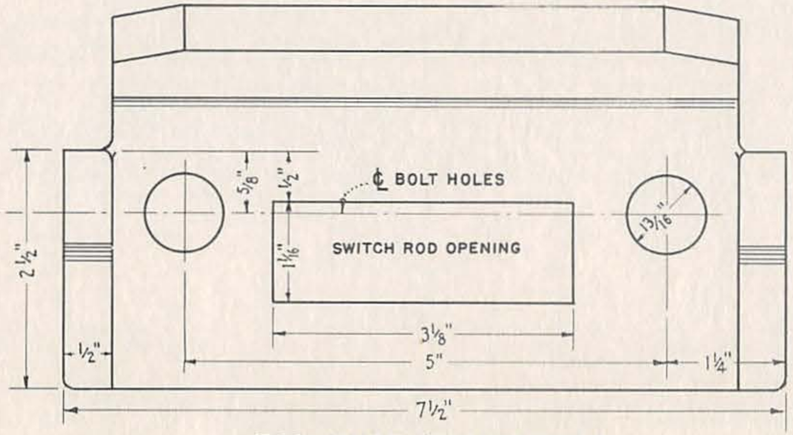
HOOK BOLT TO BE MADE OF MILD O.H.STEEL AND WEIGHT AND SECTION OF RAIL MUST BE GIVEN WHEN ORDERING.

ANTI-CREEPERS TO BE USED WHEN NECESSARY TO PREVENT RAIL CREEPING.
FOR INSTALLATIONS AT INTERLOCKING PLANTS, SEE STANDARD PLAN OF GAUGE PLATES, ADJUSTABLE BRACES, ETC. AS INDICATED IN DOTTED LINES.

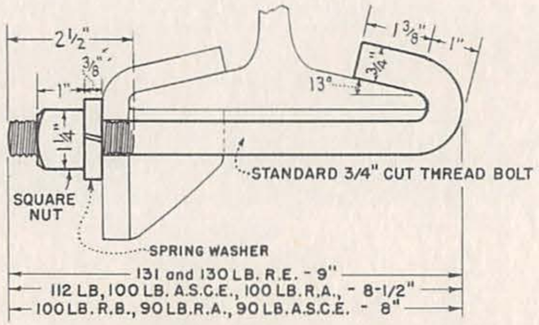
HOOK BOLTS AND ROD GUIDES WILL BE FURNISHED FROM MARTINSBURG SHOP.


2⅝"
½"
13°
9/16"
½"
⅝"
½"
1"
1 1/16"
15/16"
2½"

ROD GUIDE (END VIEW)


℄ BOLT HOLES
⅝"
½"
SWITCH ROD OPENING
1 1/16"
13/16"
2½"
3⅛"
5"
½"
1¼"
7½"

ROD GUIDE (FACING RAIL)

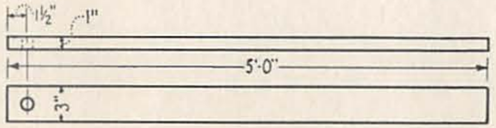

2½"
3/8"
1"
1⅜"
1"
3/4"
13°
1¼"
STANDARD 3/4" CUT THREAD BOLT
SQUARE NUT
SPRING WASHER
131 and 130 LB. R.E. - 9"
112 LB, 100 LB. A.S.C.E., 100 LB. R.A., - 8-1/2"
100 LB. R.B., 90 LB. R.A., 90 LB. A.S.C.E. - 8"

HOOK BOLT

APPROVED- C.B. Harrison
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

APPROVED- C.C. Van Horn
Vice President, Operation & Maintenance



NO.2 ROD

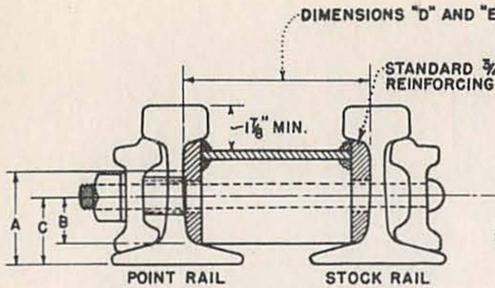
BALTIMORE & OHIO RAILROAD

SPLIT SWITCH DERAIL

Office of Chief Engineer Maintenance
Baltimore, Md.
March 4, 1946

S.M.B.

35790
50J-38


DIMENSIONS "D" AND "E" GIVEN FOR ELEVATION "A"
STANDARD 3/4" REINFORCING BAR
1-7/8" MIN.
A
C
B
POINT RAIL
STOCK RAIL

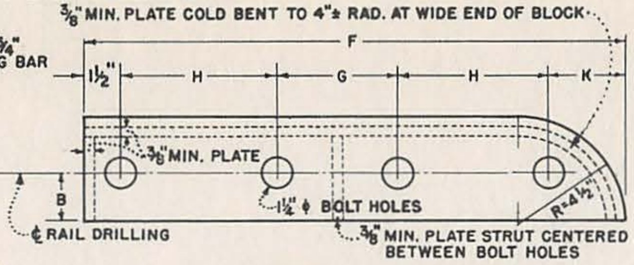
SECTION - SWITCH HEEL BLOCK

"A" DIMENSION

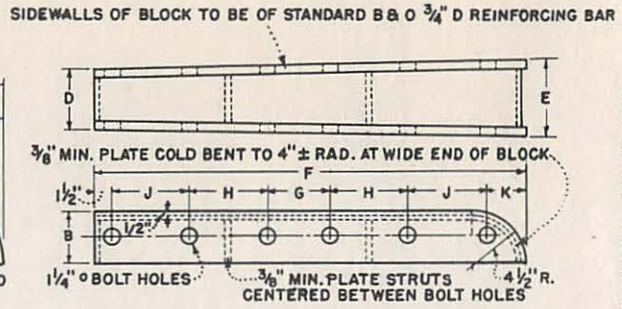
100# R.B. SECTION
BASE TO ℄ DRILLING & 12" RADIUS OF WEB

130# SECTION
BASE TO ℄ 14" RADIUS OF WEB

112# & 131# SECTION
BASE TO ℄ JUNCTION OF 10" & 23" RADII OF WEB


3/8" MIN. PLATE COLD BENT TO 4"± RAD. AT WIDE END OF BLOCK
F
1-1/2"
H
G
H
K
3/8" MIN. PLATE
B
1-1/4" ϕ BOLT HOLES
R=4-1/2"
℄ RAIL DRILLING
3/8" MIN. PLATE STRUT CENTERED BETWEEN BOLT HOLES

HORIZONTAL VIEW - 4 HOLE BLOCK


SIDEWALLS OF BLOCK TO BE OF STANDARD B & O 3/4" D REINFORCING BAR
D
E
3/8" MIN. PLATE COLD BENT TO 4" ± RAD. AT WIDE END OF BLOCK
F
1-1/2"
J
H
G
H
J
K
1/2"
B
1-1/4" ϕ BOLT HOLES
3/8" MIN. PLATE STRUTS CENTERED BETWEEN BOLT HOLES
4-1/2" R.

TOP AND SIDE VIEWS OF 6 HOLE BLOCK

NOTE

HEEL BLOCKS FOR SWITCHES WILL BE ORDERED EITHER WITH SWITCHES OR SEPARATELY BUT MUST IN ALL CASES BE LISTED AS A SEPARATE ITEM.

REQUISITION TO SPECIFY - LENGTH OF POINT - WEIGHT - SECTION OF RAIL & DRILLING.

BLOCKS WILL BE FURNISHED COMPLETE WITH BENT ANGLE BAR, BOLTS, NUTS, SPRINGWASHERS AND ONE (1) PIPE THIMBLE PER BLOCK.

BLOCKS WILL BEAR IDENTIFICATION MARKING - INDICATING WEIGHT AND SECTION OF RAIL, SWITCH POINT LENGTH AND MANUFACTURER.

BENT ANGLE BAR TO BE REAMED IN FIRST AND LAST HOLE TO PROVIDE GOOD BEARING FOR PIPE THIMBLE, BAR TO BE BENT 1/4" IN HALF ITS LENGTH.

PIPE THIMBLE TO BE HEAVY SEAMLESS TUBING WITH 3/16" SIDEWALL, INSIDE DIAMETERS SHOWN IN COLUMN 4 OF TABLE.

FOR DETAILS OF BOLTS SEE PLAN OF HEEL AND TOE BLOCK BOLTS.

HEEL BLOCKS WILL BE GENERALLY FURNISHED FROM MARTINSBURG SHOP.

LEGEND FOR SWITCH HEEL BLOCKS

(DIMENSIONS IN INCHES)

WEIGHT & SECTION	SWITCH LENGTH	SWITCH ANGLE	PIPE THIMBLE	HEEL SPREAD	BOLTS		BLOCK DIMENSIONS & DATA										∠ BAR		REMARKS
					NO.	SIZE	A	B	C	D	E	F	G	H	J	K	L	DRLG.	
131 R.E.	30'	0°59'23"	1-1/8 × 2-7/16	6-1/2	6	1 × 13	4-1/4	2-1/8	3-3/32	5-1/2	6-3/16	36	5-1/8	6-1/2	6-1/2	3-3/8	36	S-1	6 HOLE BAR
131 R.E.	24'	1°14'15"	1-1/8 × 2-7/16	6-1/2	6	1 × 13	4-1/4	2-1/8	3-3/32	5-7/16	6-1/4	36	5-1/8	6-1/2	6-1/2	3-3/8	36	S-1	6 HOLE BAR
131 R.E.	16-1/2'	1°47'56"	1-1/8 × 2-7/16	6-1/2	6	1 × 13	4-1/4	2-1/8	3-3/32	5-1/4	6-7/16	36	5-1/8	6-1/2	6-1/2	3-3/8	36	S-1	6 HOLE BAR
131 R.E.	13'	1°54'58"	1-1/8 × 2-7/16	6-1/2	6	1 × 13	4-1/4	2-1/8	3-3/32	5-1/8	6-9/16	36	5-1/8	6-1/2	6-1/2	3-3/8	36	S-1	6 HOLE BAR
131 R.E.	30'	0°59'23"	1-1/8 × 2-7/16	6-1/2	4	1 × 13	4-1/4	2-1/8	3-3/32	5-11/16	6-1/16	22-1/2	5-1/8	6-1/2	--	2-7/8	24	S-2	4 HOLE BAR
131 R.E.	24'	1°14'15"	1-1/8 × 2-7/16	6-1/2	4	1 × 13	4-1/4	2-1/8	3-3/32	5-9/16	6-1/8	22-1/2	5-1/8	6-1/2	--	2-7/8	24	S-2	4 HOLE BAR
131 R.E.	16-1/2'	1°47'56"	1-1/8 × 2-7/16	6-1/2	4	1 × 13	4-1/4	2-1/8	3-3/32	5-1/2	6-3/16	22-1/2	5-1/8	6-1/2	--	2-7/8	24	S-2	4 HOLE BAR
131 R.E.	13'	1°54'58"	1-1/8 × 2-7/16	6-1/2	4	1 × 13	4-1/4	2-1/8	3-3/32	5-3/8	6-3/16	22-1/2	5-1/8	6-1/2	--	2-7/8	24	S-2	4 HOLE BAR
130 R.E.	30'	0°59'23"	1-1/4 × 2-3/4	6-1/2	4	1-1/8 × 12-3/4	3-3/8	1-3/4	2-3/4	5-11/16	6	20	5	5-1/2	--	2-1/2	25	O-1	4 HOLE BAR
130 R.E.	24'	1°14'15"	1-1/4 × 2-3/4	6-1/2	4	1-1/8 × 12-3/4	3-3/8	1-3/4	2-3/4	5-5/8	6-1/16	20	5	5-1/2	--	2-1/2	25	O-1	4 HOLE BAR
130 R.E.	16-1/2'	1°47'56"	1-1/4 × 2-3/4	6-1/2	4	1-1/8 × 12-3/4	3-3/8	1-3/4	2-3/4	5-1/2	6-3/16	20	5	5-1/2	--	2-1/2	25	O-1	4 HOLE BAR
130 R.E.	13'	1°54'58"	1-1/4 × 2-3/4	6-1/2	4	1-1/8 × 12-3/4	3-3/8	1-3/4	2-3/4	5-7/16	6-1/4	20	5	5-1/2	--	2-1/2	25	O-1	4 HOLE BAR
112 R.E.	30'	0°59'23"	1-1/8 × 2-7/16	6-1/2	6	1 × 12-3/4	3-3/4	2	2-7/8	5-9/16	6-1/4	36	5-1/8	6-1/2	6-1/2	3-3/8	36	R-1	6 HOLE BAR
112 R.E.	24'	1°14'15"	1-1/8 × 2-7/16	6-1/2	6	1 × 12-3/4	3-3/4	2	2-7/8	5-1/2	6-5/16	36	5-1/8	6-1/2	6-1/2	3-3/8	36	R-1	6 HOLE BAR
112 R.E.	16-1/2'	1°47'56"	1-1/8 × 2-7/16	6-1/2	6	1 × 12-3/4	3-3/4	2	2-7/8	5-3/8	6-1/2	36	5-1/8	6-1/2	6-1/2	3-3/8	36	R-1	6 HOLE BAR
112 R.E.	13'	1°54'58"	1-1/8 × 2-7/16	5-1/2	6	1 × 11-3/4	3-3/4	2	2-7/8	4-1/4	5-9/16	36	5-1/8	6-1/2	6-1/2	3-3/8	36	R-1	6 HOLE BAR
112 R.E.	30'	0°59'23"	1-1/8 × 2-7/16	6-1/2	4	1 × 12-3/4	3-3/4	2	2-7/8	5-11/16	6-1/8	22-1/2	5-1/8	6-1/2	--	2-7/8	24	R-2	4 HOLE BAR
112 R.E.	24'	1°14'15"	1-1/8 × 2-7/16	6-1/2	4	1 × 12-3/4	3-3/4	2	2-7/8	5-5/8	6-1/8	22-1/2	5-1/8	6-1/2	--	2-7/8	24	R-2	4 HOLE BAR
112 R.E.	16-1/2'	1°47'56"	1-1/8 × 2-7/16	6-1/2	4	1 × 12-3/4	3-3/4	2	2-7/8	5-9/16	6-1/4	22-1/2	5-1/8	6-1/2	--	2-7/8	24	R-2	4 HOLE BAR
112 R.E.	13'	1°54'58"	1-1/8 × 2-7/16	5-1/2	4	1 × 11-3/4	3-3/4	2	2-7/8	4-1/2	5-5/16	22-1/2	5-1/8	6-1/2	--	2-7/8	24	R-2	4 HOLE BAR
100 R.B.	30'	0°59'23"	1-1/8 × 2-3/8	6-1/2	6	1-1/16 × 12-1/2	2-65/128	1-5/8	2-65/128	5-5/8	6-1/4	27	4	4	5-1/2	2-1/2	27	N-2	6 HOLE BAR
100 R.B.	24'	1°14'15"	1-1/8 × 2-3/8	6-1/2	6	1-1/16 × 12-1/2	2-65/128	1-5/8	2-65/128	5-5/8	6-1/4	27	4	4	5-1/2	2-1/2	27	N-2	6 HOLE BAR
100 R.B.	16-1/2'	1°47'56"	1-1/8 × 2-3/8	6-1/2	6	1-1/16 × 12-1/2	2-65/128	1-5/8	2-65/128	5-1/2	6-3/8	27	4	4	5-1/2	2-1/2	27	N-2	6 HOLE BAR
100 R.B.	13'	1°54'58"	1-1/8 × 2-3/8	5-1/2	6	1-1/16 × 11-1/2	2-65/128	1-5/8	2-65/128	4-3/8	5-3/8	27	4	4	5-1/2	2-1/2	27	N-2	6 HOLE BAR
100 R.B.	11'	2°15'51"	1-1/8 × 2-3/8	5-1/2	6	1-1/16 × 11-1/2	2-65/128	1-5/8	2-65/128	4-3/8	5-1/2	27	4	4	5-1/2	2-1/2	27	N-2	6 HOLE BAR

FIRST DIMENSION IN COLUMN 4 IS INSIDE DIAMETER OF PIPE THIMBLE.

APPROVED-
Chief Engineer Maintenance

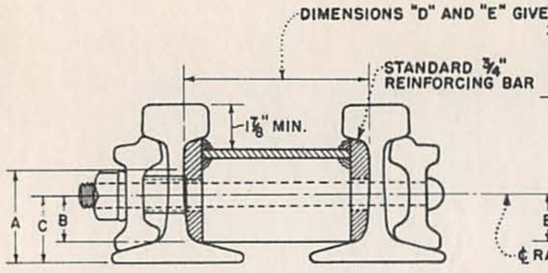
APPROVED-
Chief Engineer

APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD
SWITCH HEEL BLOCKS
Office of Chief Engineer Maintenance
Baltimore, Md.
March 22, 1946

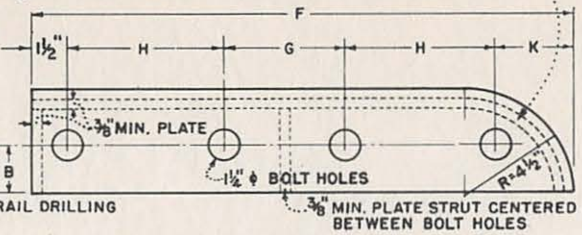
S·M·B

35828
50J-44

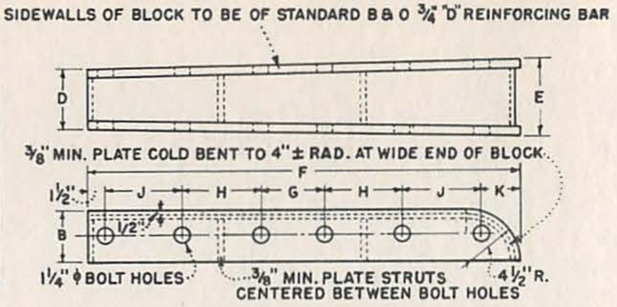

DIMENSIONS "D" AND "E" GIVEN FOR ELEVATION "A"
STANDARD 3/4" REINFORCING BAR
1 7/8" MIN.
A
C
B

SECTION - FROG HEEL BLOCK

"A" DIMENSION
100# R.B. SECTION
BASE TO ℄ DRILLING & 12" RADIUS OF WEB
130# SECTION
BASE TO ℄ 14" RADIUS OF WEB
112# & 131# SECTION
BASE TO ℄ JUNCTION OF 10" & 23" RADII OF WEB


3/8" MIN PLATE COLD BENT TO 4"± RAD. AT WIDE END OF BLOCK
F
1½"
H
G
H
K
3/8" MIN. PLATE
1¼" ϕ BOLT HOLES
R=4½
B
℄ RAIL DRILLING
3/8" MIN. PLATE STRUT CENTERED BETWEEN BOLT HOLES

HORIZONTAL VIEW - 4 HOLE BLOCK


SIDEWALLS OF BLOCK TO BE OF STANDARD B & O 3/4" "D" REINFORCING BAR
D
E
3/8" MIN. PLATE COLD BENT TO 4" ± RAD. AT WIDE END OF BLOCK
F
1½"
J
H
G
H
J
K
1/2"
B
1¼" ϕ BOLT HOLES
3/8" MIN. PLATE STRUTS CENTERED BETWEEN BOLT HOLES
4½" R.

TOP AND SIDE VIEWS OF 6 HOLE BLOCK

NOTE

HEEL AND TOE BLOCKS FOR FROGS TO BE ORDERED EITHER WITH FROGS OR SEPARATELY, BUT MUST IN ALL CASES BE LISTED AS A SEPARATE ITEM. REQUISITION MUST SPECIFY FROG NUMBER, WEIGHT AND SECTION OF RAIL, DRILLING AND USE, I.E. WITH SPRING RAIL, RAIL BOUND, OR RIGID FROGS. TOE BLOCKS FOR SPRING FROGS TO BE EQUIPPED WITH ONE BENT BAR, ONE PIPE THIMBLE, BOLTS, NUTS AND SPRING WASHERS. TOE BLOCKS FOR RAILBOUND AND RIGID FROGS TO BE EQUIPPED WITH BOLTS, NUTS AND SPRING-WASHERS AND ARE INTERCHANGEABLE (EXCEPT FOR SPRING FROGS) FOR SAME FROG NUMBER, WEIGHT AND SECTION OF RAIL. HEEL BLOCKS TO BE EQUIPPED WITH BOLTS, NUTS AND SPRINGWASHERS, AND ARE INTERCHANGEABLE FOR THE SAME FROG NUMBER, WEIGHT AND SECTION OF RAIL. BLOCKS WILL BEAR IDENTIFICATION MARKING INDICATING FROG NUMBER, HEEL OR TOE, TYPE OF FROG AND MANUFACTURER. THE BENT BAR FOR SPRING FROG TOE BLOCKS TO BE REAMED IN FIRST AND LAST HOLE TO PROVIDE GOOD BEARING FOR PIPE THIMBLE, AND TO BE BENT 1/4" IN HALF ITS LENGTH, AND BEVELLED IF NECESSARY TO INSURE A GOOD FIT AT ITS END. PIPE THIMBLE TO BE OF SEAMLESS TUBING WITH 3/16" SIDEWALL AND DIMENSIONS AS SHOWN.

FOR DETAILS OF BOLTS SEE PLAN OF HEEL AND TOE BLOCK BOLTS.

FOR LENGTHS OF HEEL AND TOE BLOCK BOLTS SEE SEPARATE PLAN.

HEEL & TOE BLOCKS WILL BE GENERALLY FURNISHED FROM MARTINSBURG.

DIMENSIONS FROG HEEL AND TOE BLOCKS

THIMBLE DIMENSIONS (INCHES)					WT. & SEC.	RAIL DRILLING & BAR LENGTH		BLOCK DIMENSIONS (INCHES)								REMARKS
RAIL WT.-SEC.	OUTSIDE DIAMETER	INSIDE DIAMETER	LENGTH	BOLT SIZE				A	B	C	F	G	H	J	K	
131 RE	1-1/2	1-1/8	2-7/16	1	131 RE	36"	S-1	4-1/2	2-1/8	3-3/32	36	5-1/8	6-1/2	6-1/2	3-3/8	6 HOLE BAR
					131 RE	24"	S-2	4-1/4	2-1/8	3-3/32	22-1/2	5-1/8	6-1/2		2-7/8	4 HOLE BAR
130 RE	1-5/8	1-1/4	2-3/4	1-1/8	130 RE	25"	0-1	3-3/8	1-3/4	2-3/4	20	5	5-1/2		2-1/2	4 HOLE BAR
112 RE	1-1/2	1-1/8	2-7/16	1	112 RE	36"	R-1	3-3/4	2	2-7/8	36	5-1/8	6-1/2	6-1/2	3-3/8	6 HOLE BAR
					112 RE	24"	R-2	3-3/4	2	2-7/8	22-1/2	5-1/8	6-1/2		2-7/8	4 HOLE BAR
100 RB	1-1/2	1-1/8	2-3/8	1-1/16	100 RB	27"	N-2	2-65/128	1-5/8	2-65/128	27	4	4	5-1/2	2-1/2	6 HOLE BAR

APPROVED- CBHarrison
Chief Engineer Maintenance

APPROVED- ACClarke
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

FROG NO.	TYPE	FROG LENGTH	FROG ANGLE	SPREAD INCHES		BLOCK DIMENSIONS (INCHES)																							
						131 RE S-1				131 RE S-2				130 RE 0-1				112 RE R-1				112 RE R-2				100 RB N-2			
						HEEL		TOE		HEEL		TOE		HEEL		TOE		HEEL		TOE		HEEL		TOE		HEEL		TOE	
				HEEL	TOE	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E
20	RIGID	28'	2°51'51"	11-3/16	5-1/2	6-13/16	8-19/32	7	8-25/32	7-1/8	8-1/4	7-5/16	8-7/16	7-1/4	8-1/4	7-5/16	8-5/16	7-5/32	8-15/16	6-25/32	8-9/16	7-15/32	8-19/32	7-3/32	8-7/32	7-7/16	8-25/32	6-15/16	8-9/32
16	RIGID	23'	3°34'47"	11-3/8	5-7/8	6-21/32	8-29/32	7-5/32	9-13/32	7-1/16	8-15/32	7-9/16	8-31/32	7-3/16	8-7/16	7-9/16	8-13/16	7	9-1/4	6-15/16	9-3/16	7-13/32	8-13/16	7-11/32	8-3/4	7-11/32	9-1/32	7-5/32	8-27/32
12	SPR.	15'	4°16'19"	9-1/2	5-1/2	4-13/32	7-7/16	6-13/32	9-7/16	4-31/32	6-27/32	6-31/32	8-27/32	5-1/8	6-25/32	7	8-21/32	4-3/4	7-25/32	6-3/16	9-7/32	5-5/16	7-3/16	6-3/4	8-5/8	5-3/16	7-7/16	6-1/2	8-3/4
12	RIGID	18'	4°16'19"	11-1/2	6-1/2	6-13/32	9-7/16	7-13/32	10-7/16	6-31/32	8-27/32	7-31/32	9-27/32	7-1/8	8-25/32	8	9-21/32	6-3/4	9-25/32	7-3/16	10-7/32	7-5/16	9-3/16	7-3/4	9-5/8	7-3/16	9-7/16	7-1/2	9-3/4
10	RIGID	15'	5°43'29"	11-5/16	6-11/16	5-7/8	9-1/2	7-5/16	10-15/16	6-17/32	8-25/32	7-31/32	10-7/32	6-23/32	8-23/32	8-1/32	10-1/32	6-7/32	9-27/32	7-3/32	10-23/32	6-7/8	9-1/8	7-3/4	10	6-23/32	9-7/16	7-15/32	10-3/16
10	SPR.	15'	5°43'29"	11-5/16	6-11/16	5-7/8	9-1/2	7-5/16	10-15/16	6-17/32	8-25/32	7-31/32	10-7/32	6-23/32	8-23/32	8-1/32	10-1/32	6-7/32	9-27/32	7-3/32	10-23/32	6-7/8	9-1/8	7-3/4	10	6-23/32	9-7/16	7-15/32	10-3/16
8	RIGID	12'	7°09'10"	11-3/4	6-1/4	5-31/32	10-15/32	6-15/32	10-31/32	6-25/32	9-19/32	7-9/32	10-3/32	6-31/32	9-15/32	7-11/32	9-27/32	6-5/16	10-13/16	6-1/4	10-3/4	7-1/8	9-15/16	7-1/16	9-7/8	6-29/32	10-9/32	6-23/32	10-3/32
8	SPR.	15'	7°09' 10"	14	8-1/2	8-7/32	12-23/32	8-23/32	13-7/32	9-1/32	11-27/32	9-17/32	12-11/32	9-7/32	11-23/32	9-19/32	12-3/32	8-9/16	13-1/16	8-1/2	13	9-3/8	12-3/16	9-5/16	12-1/8	9-5/32	12-17/32	8-31/32	12-11/32
7	RIGID	12'	8°10'16"	13-5/16	7-3/16	7-7/32	12-3/8	7-3/32	12-1/4	8-5/32	11-3/8	8-1/32	11-1/4	8-3/8	11-7/32	8-1/8	10-31/32	7-9/16	12-23/32	6-7/8	12-1/32	8-1/2	11-23/32	7-13/16	11-1/32	8-1/4	12-3/32	7-7/16	11-9/32
6	RIGID	10'	9°31'39"	12-7/16	7-1/2	5-15/16	11-15/16	7	13	7-1/32	10-25/32	8-3/32	11-27/32	7-1/4	10-19/32	8-3/16	11-17/32	6-9/32	12-9/32	6-25/32	12-25/32	7-3/8	11-1/8	7-7/8	11-5/8	7-1/16	11-9/16	7-7/16	11-15/16

BALTIMORE & OHIO RAILROAD

FROG HEEL AND TOE BLOCKS

Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

35840
50J-46

1" BOLTS FOR 131 LB. R.E. FROGS (LENGTHS IN INCHES)

FROG	TOE BLOCK BOLT LENGTHS						HEEL BLOCK BOLT LENGTHS					
	#1	#2	#3	#4	#5	#6	#1	#2	#3	#4	#5	#6
NO. 8 RIGID	16	16¾	17½	18¼	19	19¾	15½	16¼	17	17¾	18½	19¼
NO. 10 RIGID	14½	15¼	15¾	16¼	17	17½	13	13¾	14¼	14¾	15½	16
NO. 10 SPRING	14½	15¼	15¾	16¼	17	17½	13	13¾	14¼	14¾	15½	16
NO. 16 RIGID	14	14½	15	15¼	15¾	16	13¾	14	14½	14¾	15¼	15¾
NO. 20 RIGID	14	14¼	14½	14¾	15¼	15½	13¾	14	14½	14¾	15	15¼

1-1/8" BOLTS FOR 130 LB. R.E. FROGS

FROG	TOE BLOCK BOLT LENGTHS				HEEL BLOCK BOLT LENGTHS			
	#1	#2	#3	#4	#1	#2	#3	#4
NO. 10 RIGID	15½	16	16½	17	14½	15	15½	16
NO. 10 SPRING	15½	16	16½	17	14½	15	15½	16
NO. 16 RIGID	14¾	15¼	15½	15¾	14¾	15¼	15½	15¾
NO. 20 RIGID	14¼	14½	14¾	15	14½	14¾	15	15¼

1" BOLTS FOR 112 LB. R.E. FROGS (LENGTHS IN INCHES)

FROG	TOE BLOCK BOLT LENGTHS						HEEL BLOCK BOLT LENGTHS					
	#1	#2	#3	#4	#5	#6	#1	#2	#3	#4	#5	#6
NO. 8 RIGID	15¼	16¼	17	17½	18½	19¼	15½	16¼	17	17¾	18½	19¼
NO. 10 RIGID	14	14¾	15¼	15¾	16½	17	13	13¾	14¼	14¾	15½	16
NO. 10 SPRING	14	14¾	15¼	15¾	16½	17	13	13¾	14¼	14¾	15½	16
NO. 16 RIGID	13½	14	14½	14¾	15¼	15½	13¾	14	14½	14¾	15¼	15¾
NO. 20 RIGID	13½	13¾	14¼	14½	14¾	15	13¾	14¼	14½	14¾	15	15¼

1-1/16" BOLTS FOR 100 LB. R.B. FROGS

FROG	TOE BLOCK BOLT LENGTHS						HEEL BLOCK BOLT LENGTHS					
	#1	#2	#3	#4	#5	#6	#1	#2	#3	#4	#5	#6
NO. 10 RIGID	14¼	14¾	15¼	15¾	16¼	16¾	13¾	14¼	14¾	15¼	15¾	16¼
NO. 10 SPRING	14¼	14¾	15¼	15¾	16¼	16¾	13¾	14¼	14¾	15¼	15¾	16¼
NO. 16 RIGID	14	14¼	14½	14¾	15	15½	14¼	14½	14¾	15	15¼	15¾

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

APPROVED- C W Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

TABLE OF LENGTHS OF HEEL & TOE BLOCK BOLTS

Office of Chief Engineer Maintenance
Baltimore, Md.
April 11, 1946

35844

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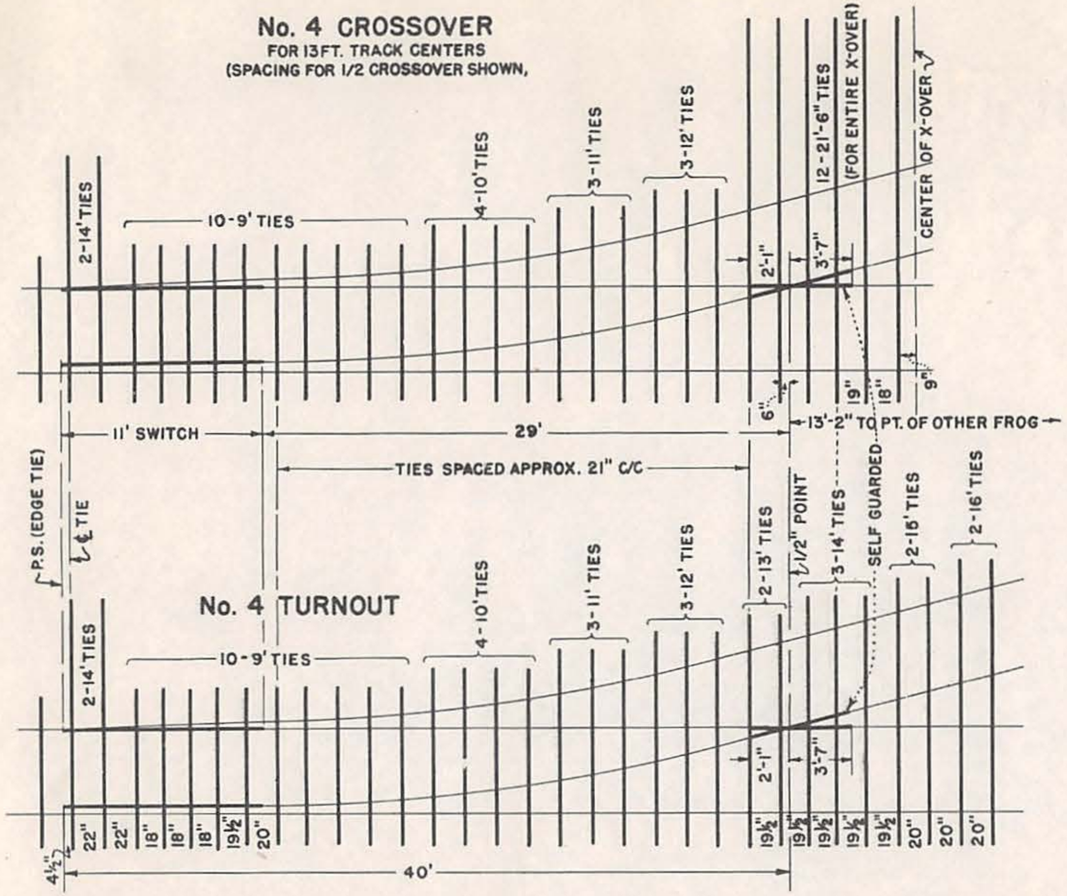
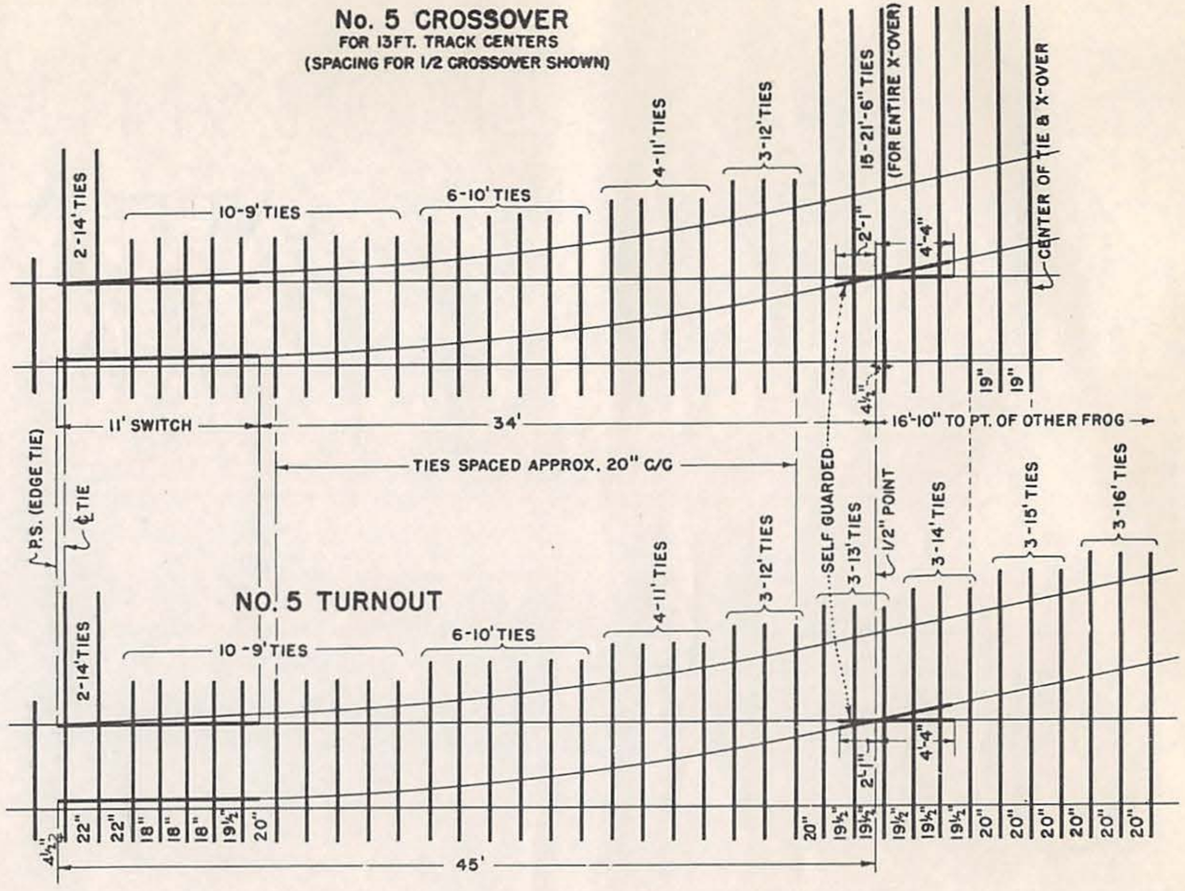

No. 4 CROSSOVER
FOR 13FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN,
2-14' TIES
10-9' TIES
4-10' TIES
3-11' TIES
3-12' TIES
12-21'-6" TIES
(FOR ENTIRE X-OVER)
CENTER OF X-OVER
2'-1"
3'-7"
6"
9"
18"
9"
11' SWITCH
29'
13'-2" TO PT. OF OTHER FROG
TIES SPACED APPROX. 21" C/C
P.S. (EDGE TIE)
℄ TIE
No. 4 TURNOUT
2-14' TIES
10-9' TIES
4-10' TIES
3-11' TIES
3-12' TIES
2-13' TIES
1/2" POINT
3-14' TIES
SELF GUARDED
2-15' TIES
2-16' TIES
2'-1"
3'-7"
4½"
22"
22"
18"
18"
18"
19½"
20"
19½"
19½"
19½"
19½"
19½"
20"
20"
20"
40'


No. 5 CROSSOVER
FOR 13FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
10-9' TIES
6-10' TIES
4-11' TIES
3-12' TIES
15-21'-6" TIES
(FOR ENTIRE X-OVER)
CENTER OF TIE & X-OVER
2'-1"
4'-4"
4½"
9"
9"
11' SWITCH
34'
16'-10" TO PT. OF OTHER FROG
TIES SPACED APPROX. 20" C/C
P.S. (EDGE TIE)
℄ TIE
NO. 5 TURNOUT
2-14' TIES
10-9' TIES
6-10' TIES
4-11' TIES
3-12' TIES
SELF GUARDED
3-13' TIES
1/2" POINT
3-14' TIES
3-15' TIES
3-16' TIES
2'-1"
4'-4"
4½"
22"
22"
18"
18"
18"
19½"
20"
20"
19½"
19½"
19½"
19½"
19½"
20"
20"
20"
20"
20"
45'

SWITCH TIES									
	9'	10'	11'	12'	13'	14'	15'	16'	21'6"
NO.4 TURNOUT	10	4	3	3	2	5	2	2	
NO.4 CROSSOVER	20	8	6	6	-	4	-	-	12
NO.5 TURNOUT	10	6	4	3	3	5	3	3	
NO.5 CROSSOVER	20	12	8	6	-	4	-	-	15

NOTE

NOS. 4 AND 5 HEAVY RAIL SELF GUARDED FROGS ARE SHOWN. WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

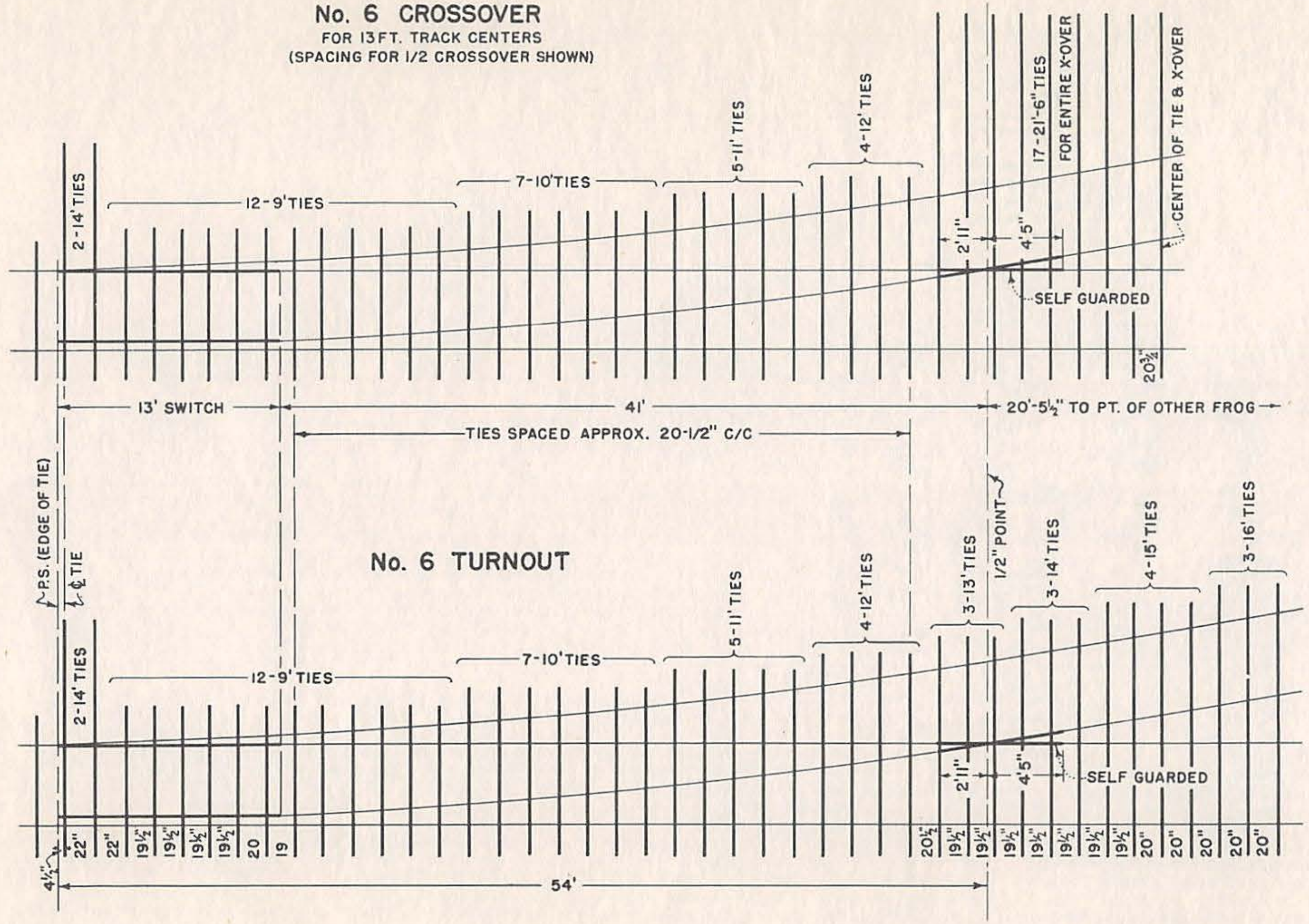
APPROVED- C W Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

TIE SPACING FOR
NOS. 4 AND 5 TURNOUTS AND CROSSOVERS

Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

35865
50J-48


No. 6 CROSSOVER
FOR 13FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
12-9' TIES
7-10' TIES
5-11' TIES
4-12' TIES
17-21'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & X-OVER
2'11"
4'5"
SELF GUARDED
20¾"
13' SWITCH
41'
20'-5½" TO PT. OF OTHER FROG
TIES SPACED APPROX. 20-1/2" C/C
P.S. (EDGE OF TIE)
℄ TIE
No. 6 TURNOUT
2-14' TIES
12-9' TIES
7-10' TIES
5-11' TIES
4-12' TIES
3-13' TIES
1/2" POINT
3-14' TIES
4-15' TIES
3-16' TIES
2'11"
4'5"
SELF GUARDED
4½"
22"
22"
19½"
19½"
19½"
19½"
20
19
20½"
19½"
19½"
19½"
19½"
19½"
19½"
19½"
20"
20"
20"
20"
20"
54'

SWITCH TIES									
	9'	10'	11'	12'	13'	14'	15'	16'	21'6"
NO. 6 TURNOUT	12	7	5	4	3	5	4	3	-
NO. 6 CROSSOVER	24	14	10	8	-	4	-	-	17

NOTE

NO. 6 HEAVY RAIL SELF GUARDED FROGS ARE SHOWN.

WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

APPROVED- CBHarrison
Chief Engineer Maintenance

APPROVED- ACClarke
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

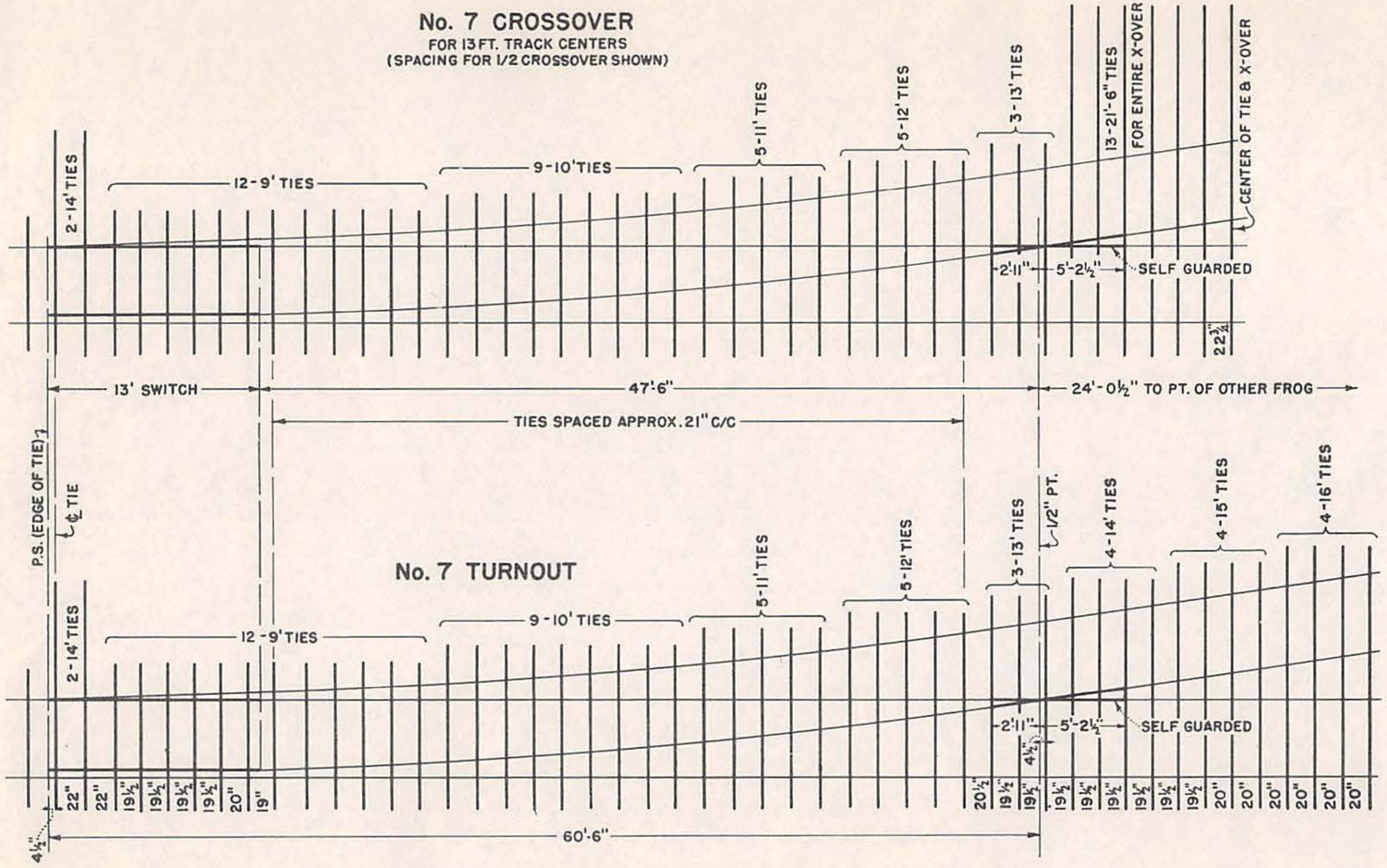
BALTIMORE & OHIO RAILROAD

TIE SPACING FOR NO. 6 TURNOUT AND CROSSOVER

Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

SHB

35866
50J-49


No. 7 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
12-9' TIES
9-10' TIES
5-11' TIES
5-12' TIES
3-13' TIES
13-21'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & X-OVER
2'11"
5'-2½"
SELF GUARDED
22½"
13' SWITCH
47'-6"
24'-0½" TO PT. OF OTHER FROG
TIES SPACED APPROX. 21" C/C
P.S. (EDGE OF TIE)
℄ TIE
½" PT.
No. 7 TURNOUT
2-14' TIES
12-9' TIES
9-10' TIES
5-11' TIES
5-12' TIES
3-13' TIES
4-14' TIES
4-15' TIES
4-16' TIES
2'11"
5'-2½"
SELF GUARDED
4½"
22"
22"
19½"
19½"
19½"
19½"
20"
19"
20½"
19½"
19½"
19½"
19½"
19½"
19½"
19½"
19½"
19½"
20"
20"
20"
20"
20"
20"
4½"
60'-6"

SWITCH TIES									
	9'	10'	11'	12'	13'	14'	15'	16'	21'6"
NO. 7 TURNOUT	12	9	5	5	3	6	4	4	--
NO. 7 CROSSOVER	24	18	10	10	6	4	-	-	13

NOTE

NO. 7 HEAVY RAIL SELF GUARDED FROGS ARE SHOWN.

WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH SWITCH STANDS USE 20' TIES.

APPROVED- C.B. Harvey
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

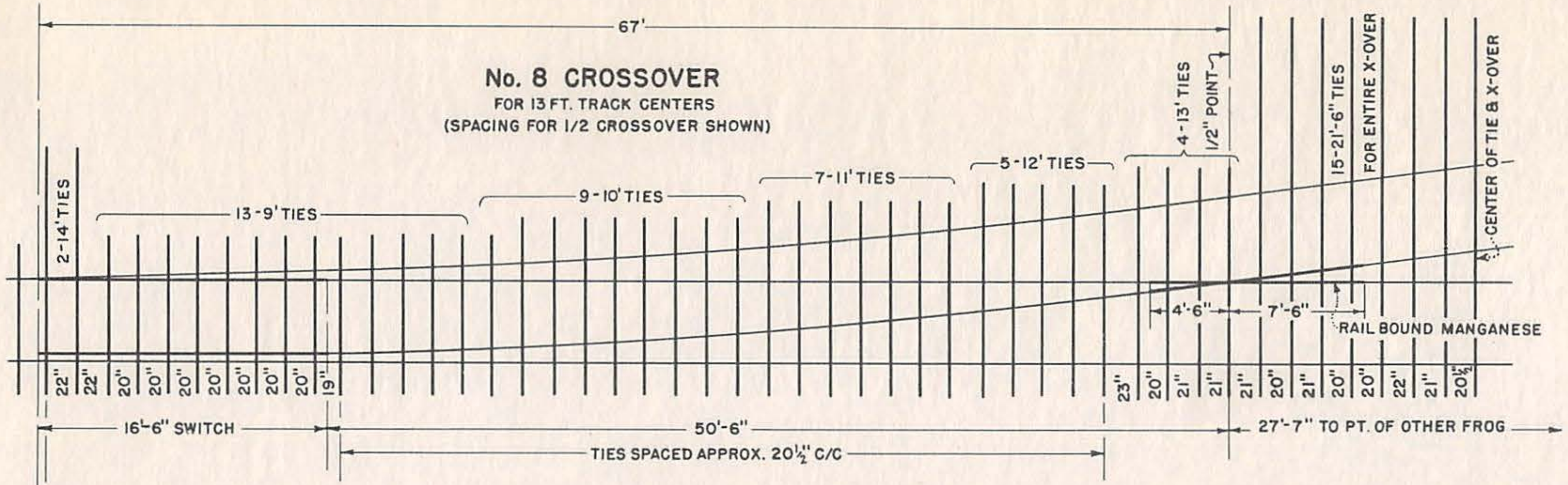
BALTIMORE & OHIO RAILROAD

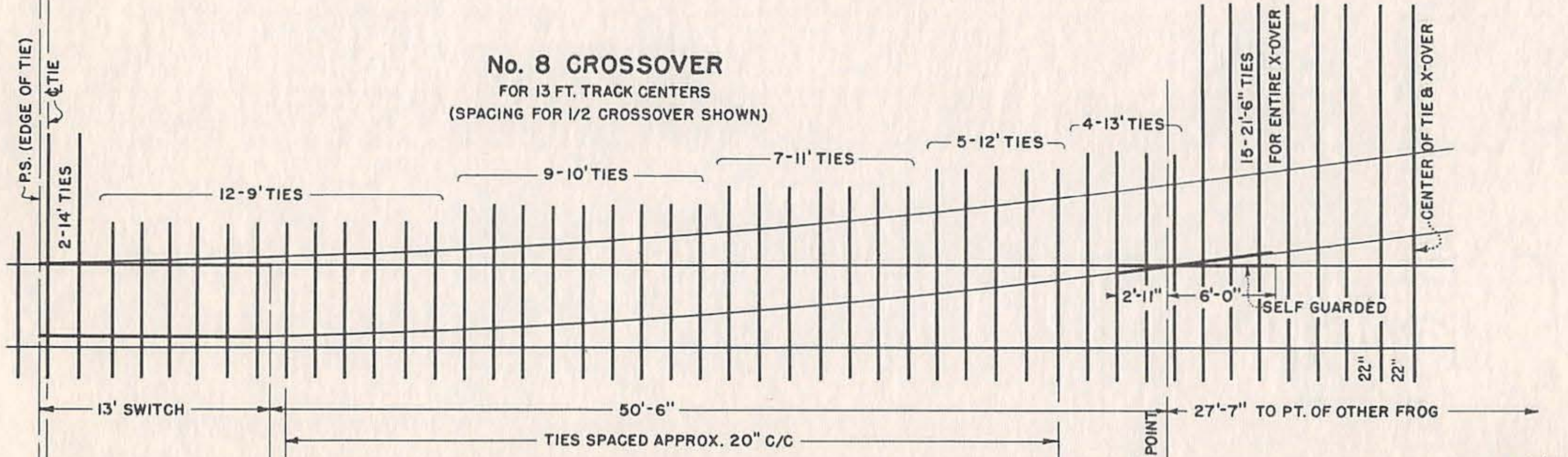
TIE SPACING FOR
NO. 7 TURNOUT AND CROSSOVER

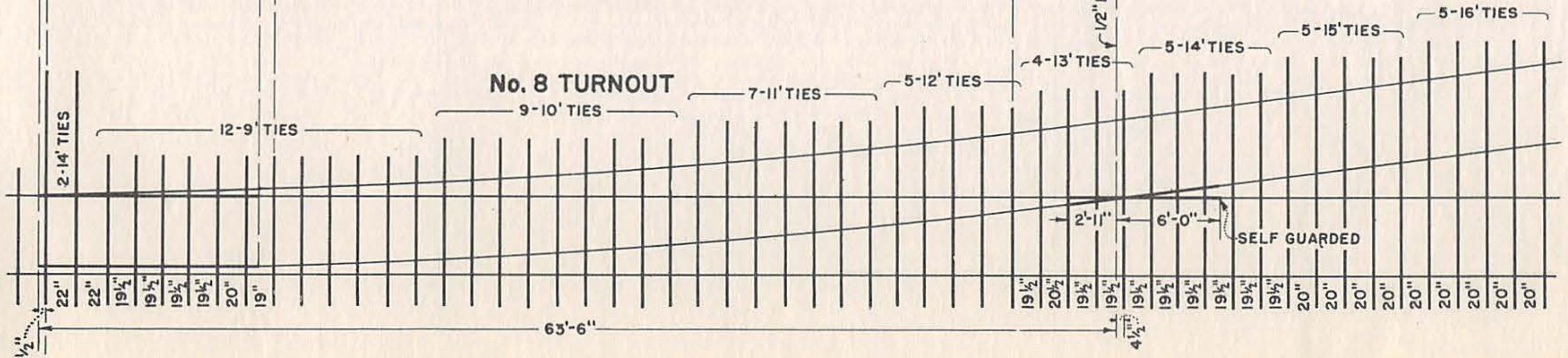
Office of Chief Engineer Maintenance
Baltimore, Md.
April 16, 1946

SMB

35867
50 J-50


67'
No. 8 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
13-9' TIES
9-10' TIES
7-11' TIES
5-12' TIES
4-13' TIES
1/2" POINT
15-21'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & X-OVER
4'-6"
7'-6"
RAIL BOUND MANGANESE
22" 22" 20" 20" 20" 20" 20" 20" 20" 19"
23" 20" 21" 21" 21" 20" 21" 20" 20" 22" 21" 20½"
16'-6" SWITCH
50'-6"
27'-7" TO PT. OF OTHER FROG
TIES SPACED APPROX. 20½" C/C


No. 8 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
P.S. (EDGE OF TIE)
℄ TIE
2-14' TIES
12-9' TIES
9-10' TIES
7-11' TIES
5-12' TIES
4-13' TIES
15-21'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & X-OVER
2'-11"
6'-0"
SELF GUARDED
22" 22"
13' SWITCH
50'-6"
27'-7" TO PT. OF OTHER FROG
TIES SPACED APPROX. 20" C/C


No. 8 TURNOUT
1/2" POINT
2-14' TIES
12-9' TIES
9-10' TIES
7-11' TIES
5-12' TIES
4-13' TIES
5-14' TIES
5-15' TIES
5-16' TIES
2'-11"
6'-0"
SELF GUARDED
22" 22" 19½" 19½" 19½" 19½" 20" 19"
19½" 20½" 19½" 19½" 19½" 19½" 19½" 19½" 20" 20" 20" 20" 20" 20" 20" 20"
63'-6"
4½"
4½"

SWITCH TIES									
	9'	10'	11'	12'	13'	14'	15'	16'	21'6"
NO.8 TURNOUT (13' SW.)	12	9	7	5	4	7	5	5	--
NO.8 CROSSOVER (16'6" SW.)	26	18	14	10	8	4	-	-	15
NO.8 CROSSOVER (13' SW.)	24	18	14	10	8	4	-	-	15

NOTE

NO. 8 HEAVY RAIL SELF GUARDED AND RAIL BOUND FROGS SHOWN.

WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

APPROVED-
Vice President, Operation & Maintenance

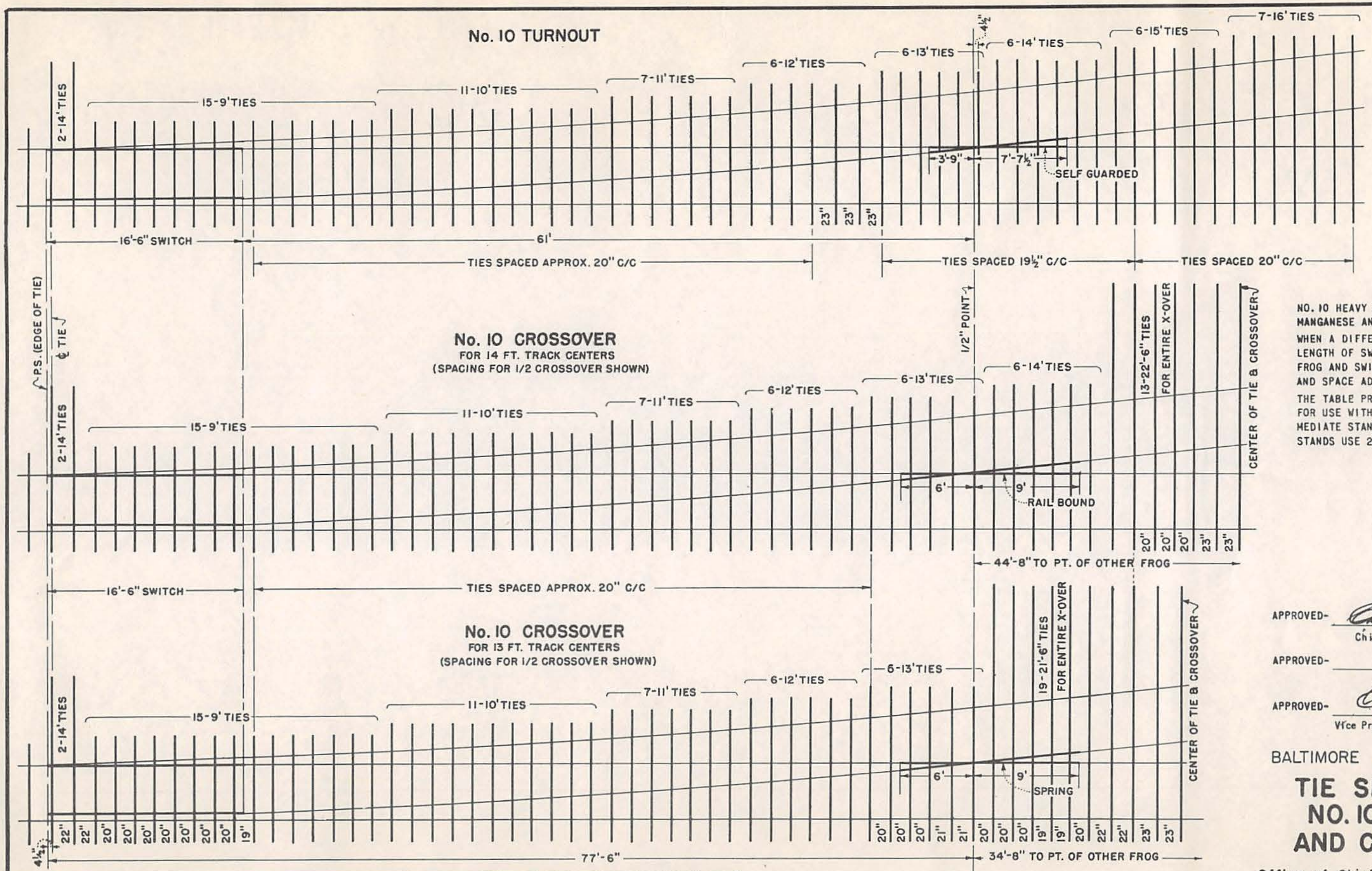
BALTIMORE & OHIO RAILROAD

TIE SPACING FOR NO. 8 TURNOUT AND CROSSOVERS

Office of Chief Engineer Maintenance
Baltimore, Md.
April 21, 1946

S.M.B.

35868
50J-51


No. 10 TURNOUT
2-14' TIES
15-9' TIES
11-10' TIES
7-11' TIES
6-12' TIES
6-13' TIES
4½"
6-14' TIES
6-15' TIES
7-16' TIES
3'-9"
7'-7½"
SELF GUARDED
23"
23"
23"
16'-6" SWITCH
61'
TIES SPACED APPROX. 20" C/C
TIES SPACED 19½" C/C
TIES SPACED 20" C/C
P.S. (EDGE OF TIE)
℄ TIE
1/2" POINT
No. 10 CROSSOVER
FOR 14 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
15-9' TIES
11-10' TIES
7-11' TIES
6-12' TIES
6-13' TIES
6-14' TIES
13-22'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & CROSSOVER
6'
9'
RAIL BOUND
20"
20"
20"
23"
23"
44'-8" TO PT. OF OTHER FROG
16'-6" SWITCH
TIES SPACED APPROX. 20" C/C
No. 10 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
15-9' TIES
11-10' TIES
7-11' TIES
6-12' TIES
6-13' TIES
19-21'-6" TIES FOR ENTIRE X-OVER
CENTER OF TIE & CROSSOVER
6'
9'
SPRING
4½"
22"
22"
20"
20"
20"
20"
20"
20"
20"
19"
20"
20"
20"
21"
21"
20"
20"
20"
19"
19"
20"
22"
22"
23"
23"
77'-6"
34'-8" TO PT. OF OTHER FROG

NOTE

NO. 10 HEAVY RAIL, SELF GUARDED, RAIL BOUND MANGANESE AND SPRING FROGS ARE SHOWN.

WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

SWITCH TIES		9'	10'	11'	12'	13'	14'	15'	16'	21'6"	22'6"
	NO. 10 TURNOUT	15	11	7	6	6	8	6	7	--	--
	NO. 10 CROSSOVER (14' TRK. CENTERS)	30	22	14	12	12	16	--	--	--	13
	NO. 10 CROSSOVER (13' TRK. CENTERS)	30	22	14	12	12	4	--	--	19	--

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

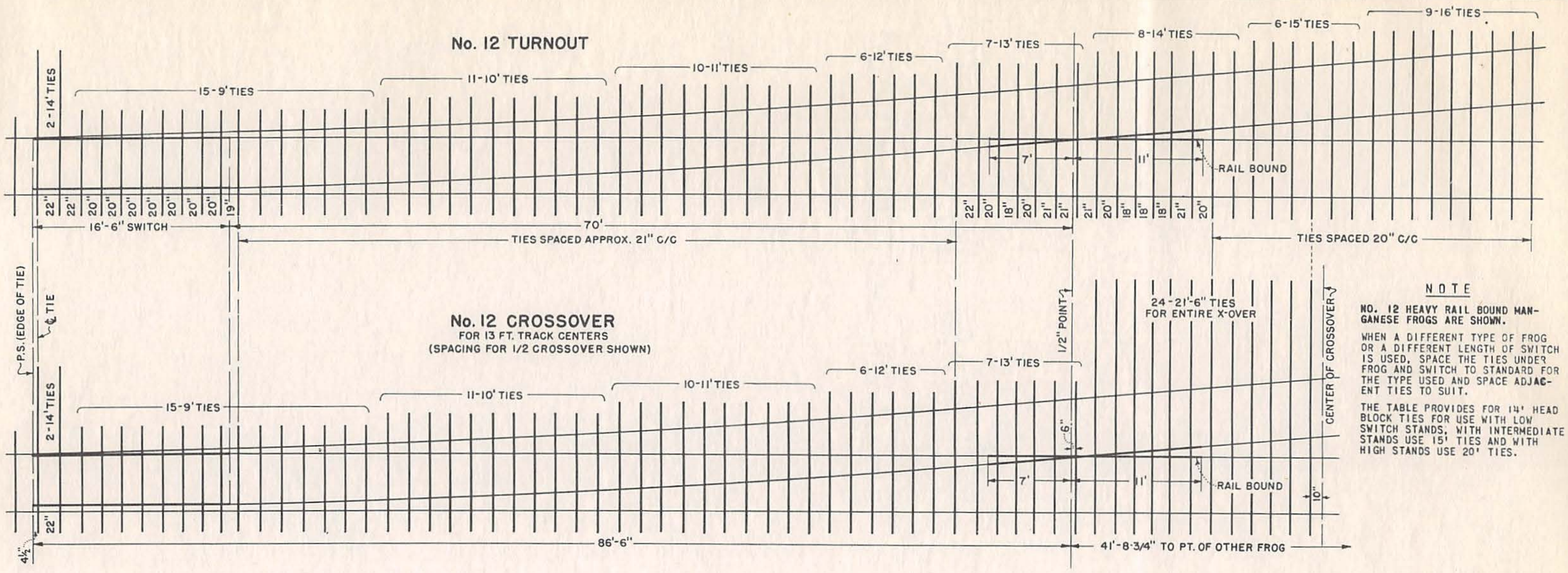
APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

TIE SPACING FOR NO. 10 TURNOUT AND CROSSOVERS

Office of Chief Engineer Maintenance
Baltimore, Md.
April 25, 1946

35869
50J-52


No. 12 TURNOUT
2-14' TIES
15-9' TIES
11-10' TIES
10-11' TIES
6-12' TIES
7-13' TIES
8-14' TIES
6-15' TIES
9-16' TIES
7'
11'
RAIL BOUND
22"
22"
20"
20"
20"
20"
20"
20"
19"
22"
20"
18"
20"
21"
21"
21"
20"
18"
18"
18"
21"
20"
16'-6" SWITCH
70'
TIES SPACED APPROX. 21" C/C
TIES SPACED 20" C/C
P.S. (EDGE OF TIE)
℄ TIE
No. 12 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
1/2" POINT
24-21'-6" TIES
FOR ENTIRE X-OVER
CENTER OF CROSSOVER
2-14' TIES
15-9' TIES
11-10' TIES
10-11' TIES
6-12' TIES
7-13' TIES
6"
7'
11'
RAIL BOUND
10"
22"
4½"
86'-6"
41'-8-3/4" TO PT. OF OTHER FROG

NOTE

NO. 12 HEAVY RAIL BOUND MANGANESE FROGS ARE SHOWN.

WHEN A DIFFERENT TYPE OF FROG OR A DIFFERENT LENGTH OF SWITCH IS USED, SPACE THE TIES UNDER FROG AND SWITCH TO STANDARD FOR THE TYPE USED AND SPACE ADJACENT TIES TO SUIT.

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

APPROVED-
Chief Engineer Maintenance

APPROVED- A.C.Clarke
Chief Engineer

APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

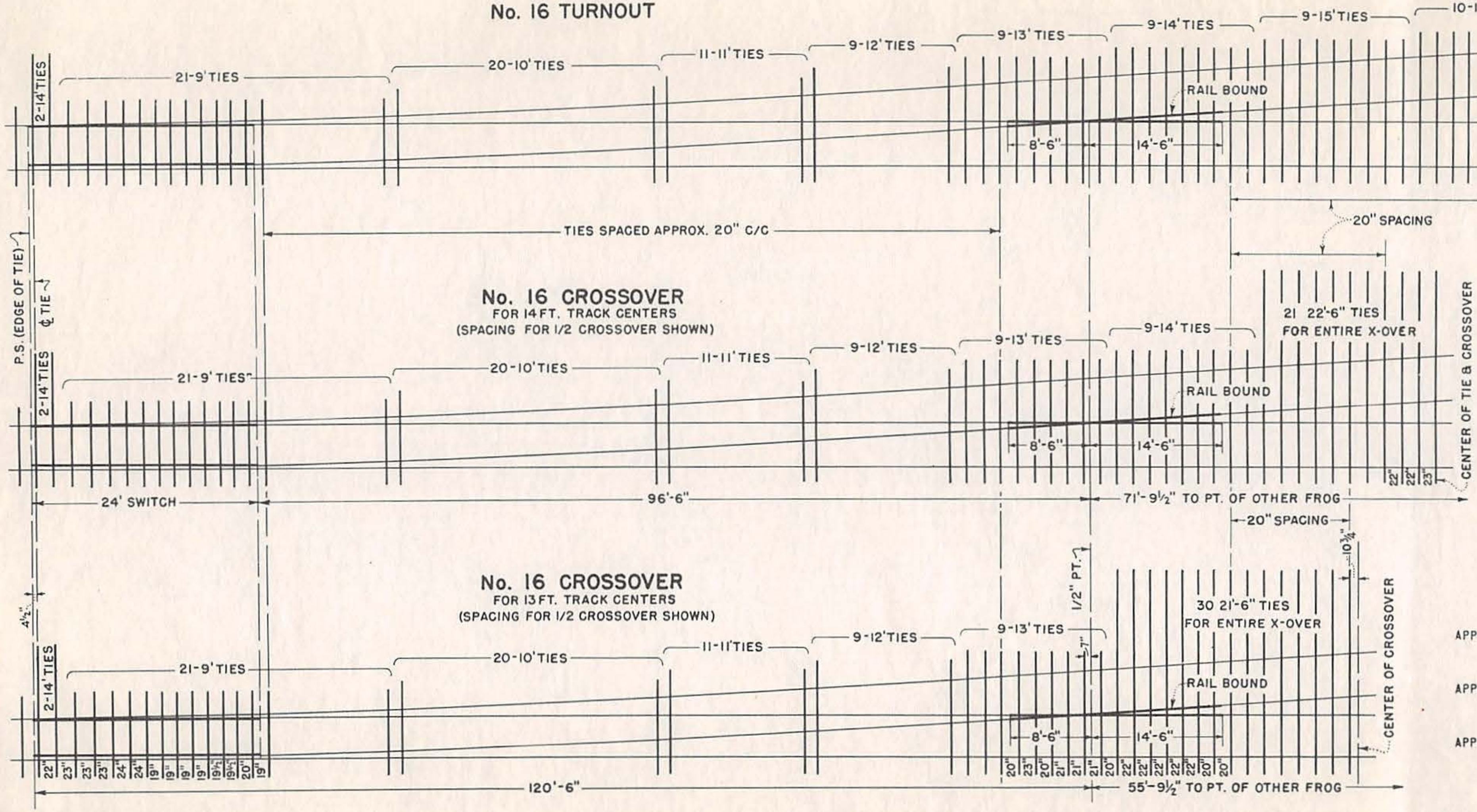
TIE SPACING FOR
NO. 12 TURNOUT AND CROSSOVER

Office of Chief Engineer Maintenance
Baltimore, Md.
April 29, 1946

		9'	10'	11'	12'	13'	14'	15'	16'	21'6"	22' 6"
SWITCH TIES	NO. 12 TURNOUT	15	11	10	6	7	10	6	9	--	--
	NO. 12 CROSSOVER (13' TRK. CENTERS)	30	22	20	12	14	4	-	-	24	--

S-M-B

35870
50J-53


No. 16 TURNOUT
2-14' TIES
21-9' TIES
20-10' TIES
11-11' TIES
9-12' TIES
9-13' TIES
9-14' TIES
9-15' TIES
10-16' TIES
RAIL BOUND
8'-6"
14'-6"
TIES SPACED APPROX. 20" C/C
20" SPACING
P.S. (EDGE OF TIE)
℄ TIE
No. 16 CROSSOVER
FOR 14 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
21-9' TIES
20-10' TIES
11-11' TIES
9-12' TIES
9-13' TIES
9-14' TIES
21 22'-6" TIES
FOR ENTIRE X-OVER
RAIL BOUND
8'-6"
14'-6"
22"
22"
23"
CENTER OF TIE & CROSSOVER
24' SWITCH
96'-6"
71'-9½" TO PT. OF OTHER FROG
20" SPACING
No. 16 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
4½"
2-14' TIES
21-9' TIES
20-10' TIES
11-11' TIES
9-12' TIES
9-13' TIES
30 21'-6" TIES
FOR ENTIRE X-OVER
1/2" PT.
7"
10¾"
RAIL BOUND
8'-6"
14'-6"
CENTER OF CROSSOVER
22" 23" 23" 23" 24" 24" 19" 19" 19" 19" 19½" 19½" 20" 19"
20" 23" 20" 21" 21" 21" 20" 22" 22" 22" 22" 22" 20" 20"
120'-6"
55'-9½" TO PT. OF OTHER FROG

SWITCH TIES

	9'	10'	11'	12'	13'	14'	15'	16'	21'6"	22'6"
NO. 16 TURNOUT	21	20	11	9	9	11	9	10	--	--
NO. 16 CROSSOVER (14' TRACK CENTERS)	42	40	22	18	18	22	-	-	--	21
NO. 16 CROSSOVER (13' TRACK CENTERS)	42	40	22	18	18	4	-	-	30	--

NOTE

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS. WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

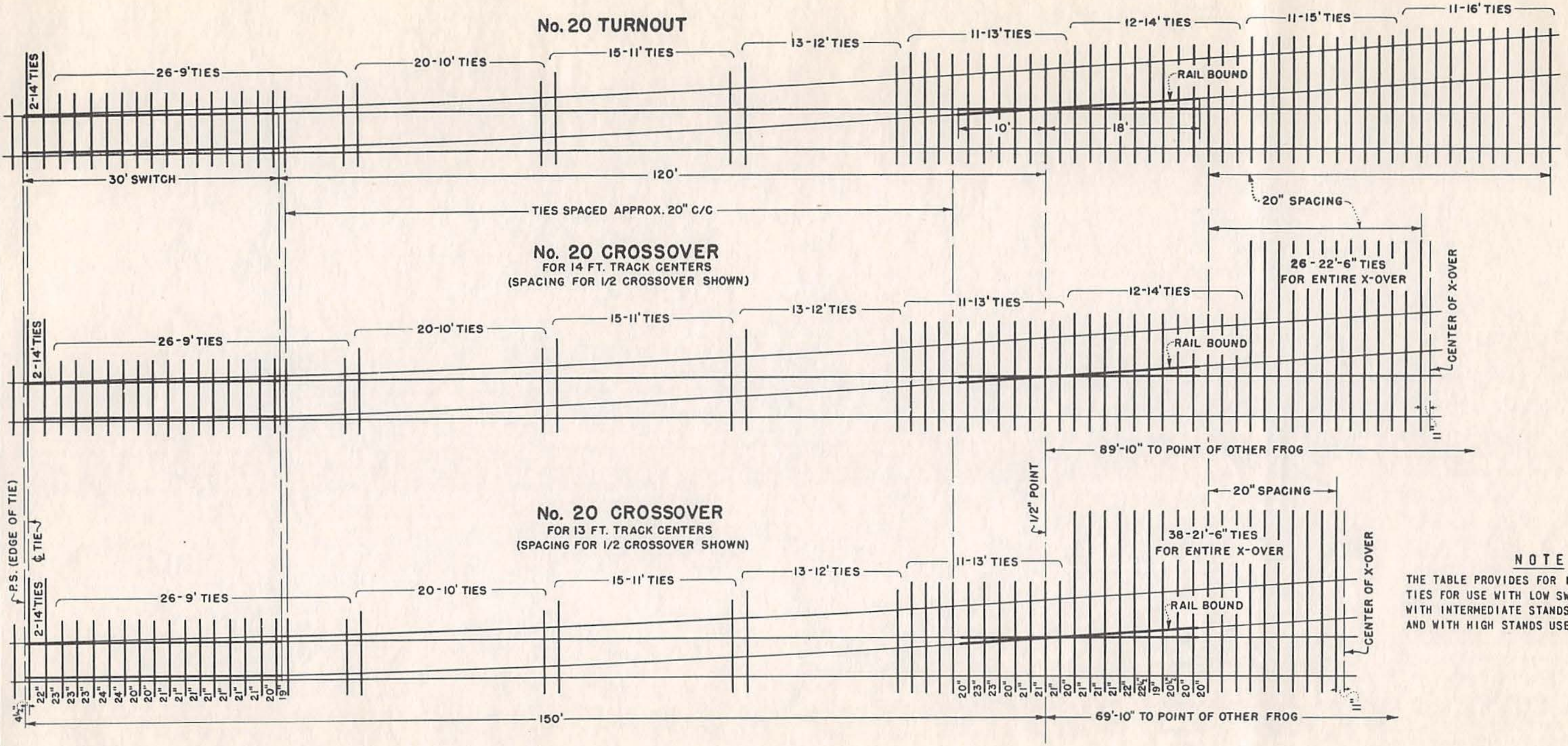
APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD

TIE SPACING FOR NO. 16 TURNOUT AND CROSSOVERS

Office of Chief Engineer Maintenance
Baltimore, Md.
May 8, 1946

35877
50J-54


No. 20 TURNOUT
2-14' TIES
26-9' TIES
20-10' TIES
15-11' TIES
13-12' TIES
11-13' TIES
12-14' TIES
11-15' TIES
11-16' TIES
RAIL BOUND
10'
18'
30' SWITCH
120'
TIES SPACED APPROX. 20" C/C
20" SPACING
No. 20 CROSSOVER
FOR 14 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
2-14' TIES
26-9' TIES
20-10' TIES
15-11' TIES
13-12' TIES
11-13' TIES
12-14' TIES
26-22'-6" TIES
FOR ENTIRE X-OVER
RAIL BOUND
CENTER OF X-OVER
11"
89'-10" TO POINT OF OTHER FROG
1/2" POINT
No. 20 CROSSOVER
FOR 13 FT. TRACK CENTERS
(SPACING FOR 1/2 CROSSOVER SHOWN)
P.S. (EDGE OF TIE)
℄ TIE
2-14' TIES
26-9' TIES
20-10' TIES
15-11' TIES
13-12' TIES
11-13' TIES
20" SPACING
38-21'-6" TIES
FOR ENTIRE X-OVER
RAIL BOUND
CENTER OF X-OVER
4½"
22" 23" 23" 23" 24" 24" 20" 20" 21" 21" 21" 21" 21" 21" 21" 20" 19"
20" 23" 23" 20" 21" 21" 21" 20" 21" 21" 21" 22" 22¼" 19" 20½" 20" 20"
11"
150'
69'-10" TO POINT OF OTHER FROG

NOTE

THE TABLE PROVIDES FOR 14' HEAD BLOCK TIES FOR USE WITH LOW SWITCH STANDS, WITH INTERMEDIATE STANDS USE 15' TIES AND WITH HIGH STANDS USE 20' TIES.

	SWITCH TIES									
	9'	10'	11'	12'	13'	14'	15'	16'	21'6"	22'6"
NO.20 TURNOUT	26	20	15	13	11	14	11	11	-	-
NO.20 CROSSOVER (14' TRACK CENTERS)	52	40	30	26	22	28	-	-	-	26
NO.20 CROSSOVER (13' TRACK CENTERS)	52	40	30	26	22	4	-	-	38	-

APPROVED- C.G. Harossen
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

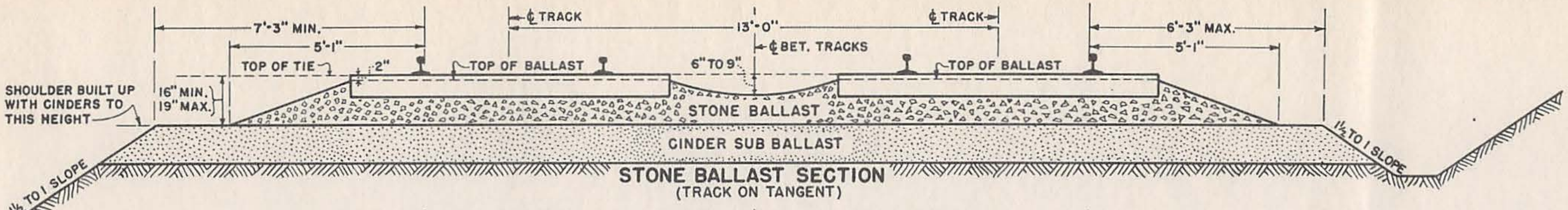
BALTIMORE & OHIO RAILROAD

TIE SPACING FOR NO. 20 TURNOUT AND CROSSOVERS

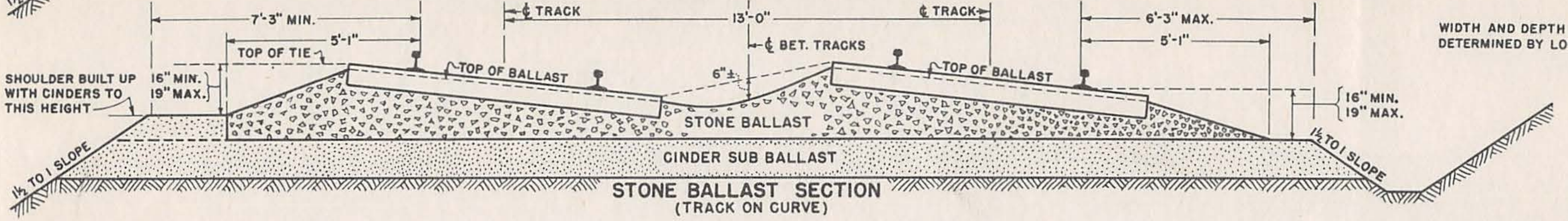
Office of Chief Engineer Maintenance
Baltimore, Md.
May 12, 1946

35878

50J-55


7'-3" MIN.
5'-1"
TOP OF TIE
2"
℄ TRACK
TOP OF BALLAST
13'-0"
℄ BET. TRACKS
6" TO 9"
℄ TRACK
TOP OF BALLAST
6'-3" MAX.
5'-1"
SHOULDER BUILT UP WITH CINDERS TO THIS HEIGHT
16" MIN.
19" MAX.
STONE BALLAST
CINDER SUB BALLAST
1½ TO 1 SLOPE
1½ TO 1 SLOPE

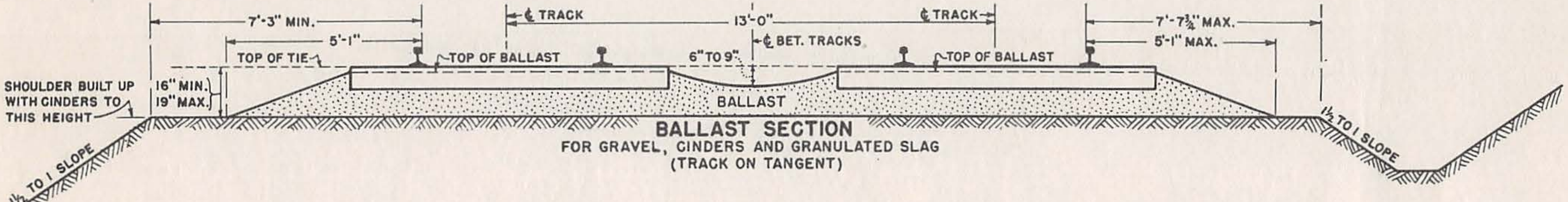
STONE BALLAST SECTION
(TRACK ON TANGENT)


7'-3" MIN.
5'-1"
TOP OF TIE
℄ TRACK
TOP OF BALLAST
13'-0"
℄ BET. TRACKS
6"±
℄ TRACK
TOP OF BALLAST
6'-3" MAX.
5'-1"
SHOULDER BUILT UP WITH CINDERS TO THIS HEIGHT
16" MIN.
19" MAX.
STONE BALLAST
CINDER SUB BALLAST
16" MIN.
19" MAX.
1½ TO 1 SLOPE
1½ TO 1 SLOPE

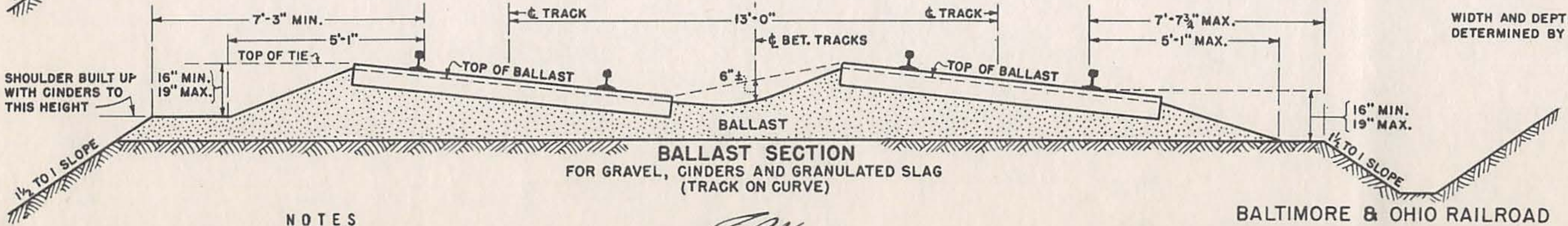
STONE BALLAST SECTION
(TRACK ON CURVE)

WIDTH AND DEPTH OF DITCH TO BE DETERMINED BY LOCAL CONDITIONS

SLOPE 1½ TO 1 OR TO SUIT MATERIAL IN CUT


7'-3" MIN.
5'-1"
TOP OF TIE
℄ TRACK
TOP OF BALLAST
13'-0"
℄ BET. TRACKS
6" TO 9"
℄ TRACK
TOP OF BALLAST
7'-7¾" MAX.
5'-1" MAX.
SHOULDER BUILT UP WITH CINDERS TO THIS HEIGHT
16" MIN.
19" MAX.
BALLAST
1½ TO 1 SLOPE
1½ TO 1 SLOPE

BALLAST SECTION
FOR GRAVEL, CINDERS AND GRANULATED SLAG
(TRACK ON TANGENT)


7'-3" MIN.
5'-1"
TOP OF TIE
℄ TRACK
TOP OF BALLAST
13'-0"
℄ BET. TRACKS
6"±
℄ TRACK
TOP OF BALLAST
7'-7¾" MAX.
5'-1" MAX.
SHOULDER BUILT UP WITH CINDERS TO THIS HEIGHT
16" MIN.
19" MAX.
BALLAST
16" MIN.
19" MAX.
1½ TO 1 SLOPE
1½ TO 1 SLOPE

BALLAST SECTION
FOR GRAVEL, CINDERS AND GRANULATED SLAG
(TRACK ON CURVE)

WIDTH AND DEPTH OF DITCH TO BE DETERMINED BY LOCAL CONDITIONS

NOTES

ON TANGENT, THE SPACE BETWEEN TRACKS FOR ALL CENTERS UP TO AND INCLUDING 15 FT., SHOULD BE DRESSED ABOUT AS SHOWN. WHERE CENTERS ARE OVER 15 FT. CENTER SHOULDERS SHOULD BE DRESSED TO SINGLE TRACK STANDARD.

ON CURVE THE SPACE BETWEEN TRACKS FOR ALL CENTERS UP TO 16 FT., SHOULD BE DRESSED ABOUT AS SHOWN. WHERE CENTERS ARE OVER 16 FT., CENTER SHOULDERS SHOULD BE DRESSED TO SINGLE TRACK STANDARD.

APPROVED- CRHarrison
Chief Engineer Maintenance

APPROVED- ACClarke
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

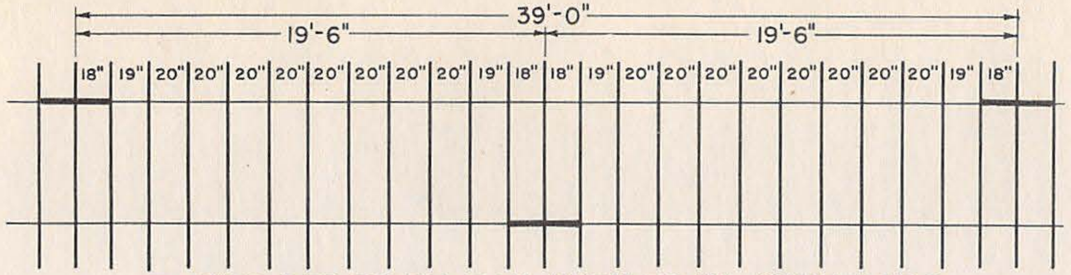
BALTIMORE & OHIO RAILROAD

BALLAST SECTIONS - MAIN TRACK FOR STONE, GRAVEL, CINDER AND GRANULATED SLAG TO BE USED IN REDRESSING TRACK

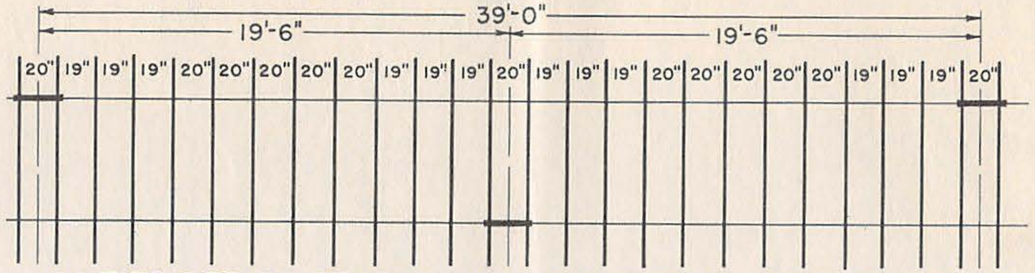
Office of Chief Engineer Maintenance
Baltimore, Md.
May 18, 1946

SMB

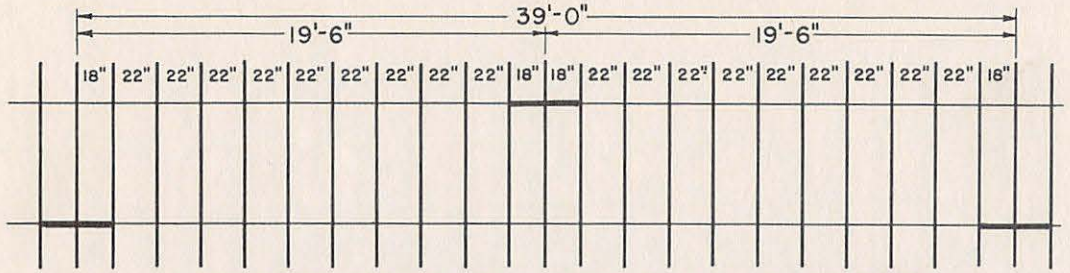
35899
50J-57


39'-0"
19'-6"
19'-6"
18" 19" 20" 20" 20" 20" 20" 20" 20" 19" 18" 18" 19" 20" 20" 20" 20" 20" 20" 20" 19" 18"

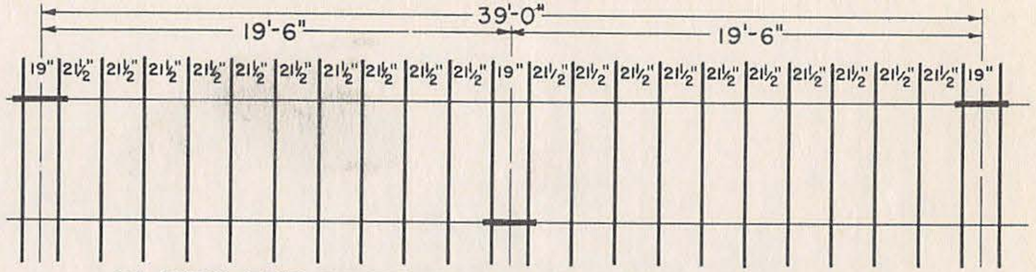
24 TIES PER 39 FT. RAIL WITH 36 IN. JOINT BARS
3249 TIES REQUIRED PER MILE OF SINGLE TRACK


39'-0"
19'-6"
19'-6"
20" 19" 19" 19" 20" 20" 20" 20" 20" 19" 19" 19" 20" 19" 19" 19" 20" 20" 20" 20" 20" 19" 19" 19" 20"

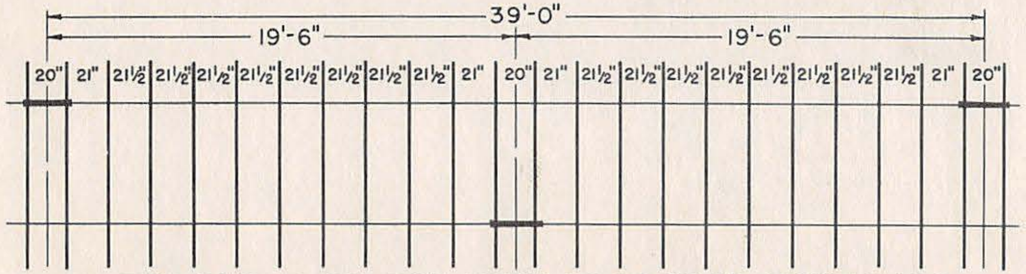
24 TIES PER 39 FT. RAIL WITH 24 OR 25 IN. JOINT BARS
3249 TIES REQUIRED PER MILE OF SINGLE TRACK


39'-0"
19'-6"
19'-6"
18" 22" 22" 22" 22" 22" 22" 22" 22" 22" 18" 18" 22" 22" 22" 22" 22" 22" 22" 22" 22" 18"

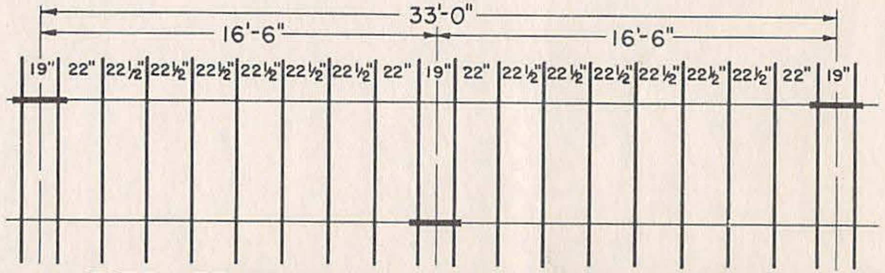
22 TIES PER 39 FT. RAIL WITH 36 IN. JOINT BARS
2979 TIES REQUIRED PER MILE OF SINGLE TRACK


39'-0"
19'-6"
19'-6"
19" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 19" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 19"

22 TIES PER 39 FT. RAIL WITH 27 IN. JOINT BARS
2979 TIES REQUIRED PER MILE OF SINGLE TRACK


39'-0"
19'-6"
19'-6"
20" 21" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21" 20" 21" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21½" 21" 20"

22 TIES PER 39 FT. RAIL WITH 24 OR 25 IN. JOINT BARS
2979 TIES REQUIRED PER MILE OF SINGLE TRACK


33'-0"
16'-6"
16'-6"
19" 22" 22½" 22½" 22½" 22½" 22½" 22½" 22" 19" 22" 22½" 22½" 22½" 22½" 22½" 22½" 22" 19"

18 TIES PER 33 FT. RAIL WITH 27 IN. JOINT BARS
2880 TIES REQUIRED PER MILE OF SINGLE TRACK

NOTE

SUFFICIENT ANTICREEPERS SHALL BE USED TO PREVENT RAIL FROM CREEPING, SIX TO TEN ANTICREEPERS PER RAIL BEING GENERALLY SUFFICIENT FOR THIS PURPOSE.

THE 24 TIE SPACING FOR 39 FT. RAIL SHALL BE USED WHEN RAISING TRACKS AND RESPACING OF TIES ON THE FOLLOWING HIGH SPEED MAIN LINE TERRITORIES.

PHILADELPHIA TO CHICAGO	CUMBERLAND TO ST. LOUIS
CINCINNATI TO TOLEDO	C. & N. DIVISION

OTHER TIE SPACINGS SHOWN SHALL BE USED ON SECONDARY MAI' LINE TRACKS AND ON RUNNING AND PASSING TRACKS.

APPROVED-
Chief Engineer Maintenance

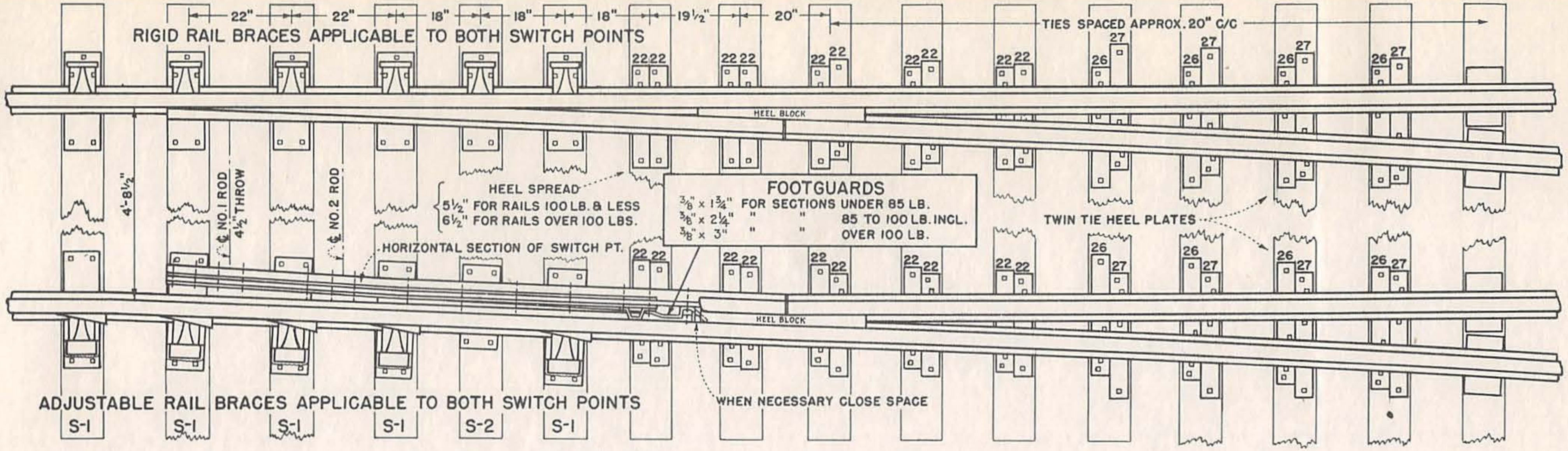
APPROVED-
Chief Engineer

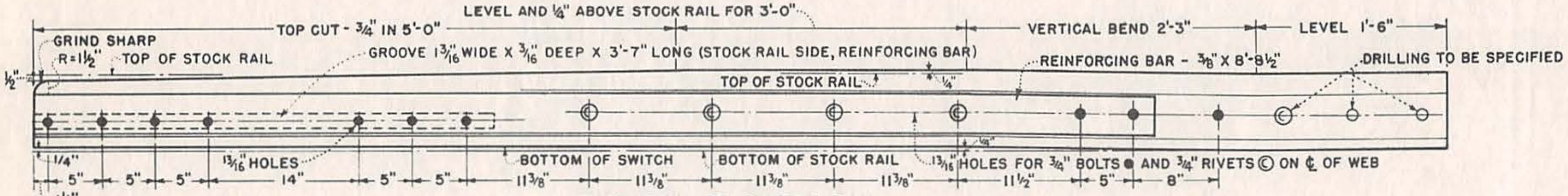
APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD
TIE SPACING - MAIN TRACKS
Office of Chief Engineer Maintenance
Baltimore, Md.
June 15, 1946

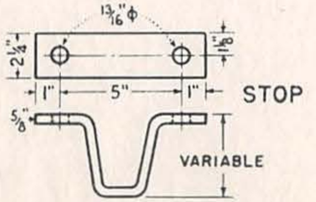
SMB

35923
50J-60

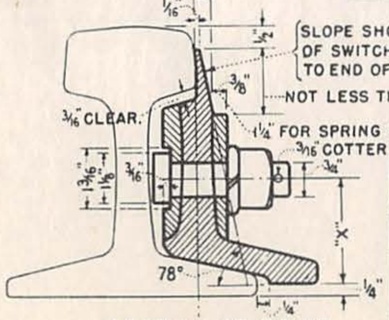

22"
22"
18"
18"
18"
19½"
20"
TIES SPACED APPROX. 20" C/C
RIGID RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
22 22
26 27
HEEL BLOCK
4'-8½"
℄ NO.1 ROD
4½" THROW
℄ NO.2 ROD
HEEL SPREAD
5½" FOR RAILS 100 LB. & LESS
6½" FOR RAILS OVER 100 LBS.
FOOTGUARDS
⅜" x 1¾" FOR SECTIONS UNDER 85 LB.
⅜" x 2¼" " " 85 TO 100 LB. INCL.
⅜" x 3" " " OVER 100 LB.
TWIN TIE HEEL PLATES
HORIZONTAL SECTION OF SWITCH PT.
WHEN NECESSARY CLOSE SPACE
ADJUSTABLE RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
S-1
S-1
S-1
S-1
S-2
S-1


LEVEL AND ¼" ABOVE STOCK RAIL FOR 3'-0"
TOP CUT - ¾" IN 5'-0"
VERTICAL BEND 2'-3"
LEVEL 1'-6"
GRIND SHARP
R=1½"
TOP OF STOCK RAIL
GROOVE 1³⁄₁₆" WIDE X ³⁄₁₆" DEEP X 3'-7" LONG (STOCK RAIL SIDE, REINFORCING BAR)
REINFORCING BAR - ⅜" X 8'-8½"
DRILLING TO BE SPECIFIED
½"
TOP OF STOCK RAIL
¼"
1/4"
¹³⁄₁₆" HOLES
BOTTOM OF SWITCH
BOTTOM OF STOCK RAIL
¹³⁄₁₆" HOLES FOR ¾" BOLTS ● AND ¾" RIVETS © ON ℄ OF WEB
5"
5"
5"
14"
5"
5"
11⅜"
11⅜"
11⅜"
11⅜"
11½"
5"
8"
1½"

ELEVATION OF SWITCH RAIL


¹³⁄₁₆" ϕ
2¼"
1⅛"
1"
5"
1"
⅝"
VARIABLE

STOP


APPROXIMATE ℄ OF WEB AND GAGE LINE OF STOCK RAIL
9/32"
1/16"
½"
SLOPE SHOWN ON GAGE SIDE OF SWITCH POINT TO EXTEND TO END OF SIDE PLANING
3/8"
NOT LESS THAN 1⅞"
3/16" CLEAR.
1¼" FOR SPRING SWITCH POINTS
3/16" COTTER
¾"
1³⁄₁₆"
1⅛"
3/16"
"X"
78°
¼"
¼"

SECTION AT POINT
(BEFORE GRINDING)

"X" DISTANCE	
RAIL	INCHES
131	2⅜
130	2⅜
112	2 5/16
100 RB	2¼
100 RA	2 7/32
90 RA	2 3/16
85ASCE	2 1/16

NOTE:

SWITCHES AND PARTS SHALL MEET A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS EXCEPT AS MAY BE NOTED ON THIS PLAN.

SEE SEPARATE PLANS FOR DETAILS OF SWITCH PLATES, GAUGE PLATES, BRACES, SWITCH RODS AND BOLTS, SWITCH CLIPS, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

SWITCH POINTS FOR RAIL SECTIONS 100# AND OVER WILL HAVE PROPER HOLE REAMED TO PROVIDE FOR PIPE THIMBLE - 1-9/16" DIAMETER FOR 1" AND 1-1/16" BOLTS, AND 1-3/4" FOR 1-1/8" BOLTS.

ALL WEB BOLTS FOR CLIPS, STOPS AND FOOT GUARDS TO BE 3/4" DIAMETER WITH REGULAR SQUARE HEAD, HEAVY SQUARE NUT, AND WITH SPRING WASHER AND 3/16" COTTER.

HEEL SPREAD WILL BE 5-1/2" FOR ALL RAILS 100# OR LESS, 6-1/2" FOR RAILS OVER 100#.

SWITCHES WITH ADJUSTABLE BRACES WILL GENERALLY BE USED ON ALL HIGH SPEED AND HEAVY TRAFFIC LINES, AND ON LADDER TRACKS IN HEAVY TRAFFIC YARDS WHERE SWITCHES ARE OF HEAVY RAIL SECTIONS. RIGID OR NON-ADJUSTABLE BRACES WILL BE USED ON ALL OTHER TURNOUTS.

SPRING SWITCHES AND FITTINGS WILL BE IDENTICAL WITH STANDARD SWITCH AS SHOWN ON THIS PLAN EXCEPT THE REINFORCING BAR ON GAUGE SIDE OF POINT WILL BE 1-1/4" THICK INSTEAD OF 3/8" AND WILL BE BOLTED TO POINT INSTEAD OF RIVETED, AND SWITCH RODS DRILLED TO CONFORM TO EXTRA THICK REINFORCING BAR.

AT INTERLOCKED AND SPRING SWITCHES, GAUGE PLATES WITH ADJUSTABLE BRACES WILL BE USED AS SHOWN ON GAUGE PLATE PLAN.

A COMPLETE SWITCH WILL INCLUDE POINTS WITH CLIPS, RODS, FOOT GUARDS, PLATES, BRACES, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

REQUISITION FOR SWITCH COMPLETE WILL SPECIFY INTERLOCKED OR NON-INTERLOCKED, INSULATED OR NON-INSULATED, TYPE OF BRACES, ADJUSTABLE OR RIGID; AND SHOW AS A SEPARATE ITEM, THE HEEL BLOCKS AND TWIN TIE HEEL PLATES REQUIRED. THE WEIGHT AND SECTION OF RAIL AND JOINT BAR DRILLING SHOULD ALWAYS BE SHOWN. HEEL BLOCKS WILL GENERALLY BE USED WITH ALL SWITCHES EXCEPT IN LIGHT TRAFFIC LINES AND SIDINGS.

APPROVED-
Chief Engineer Maintenance

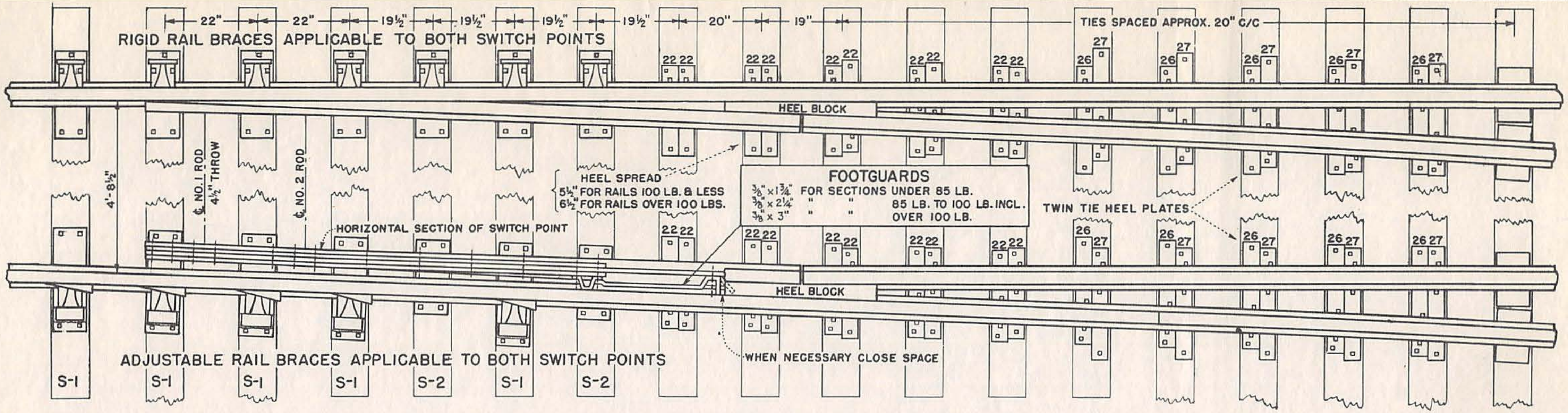
APPROVED-
Chief Engineer

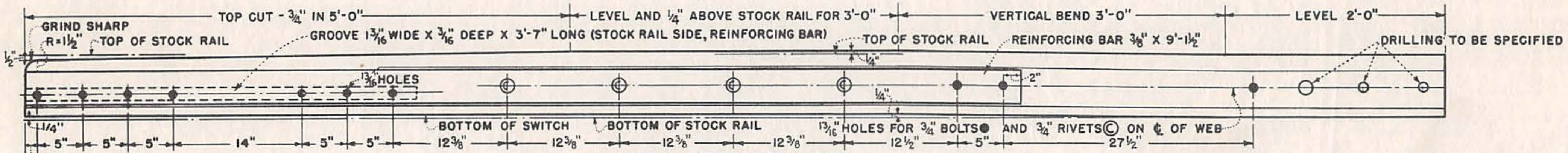
APPROVED-
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD
11 FT. SPLIT SWITCH
Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

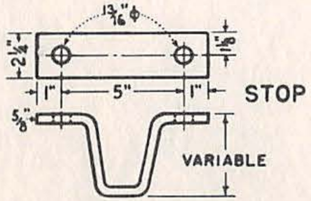
SMB

36052
50J-73

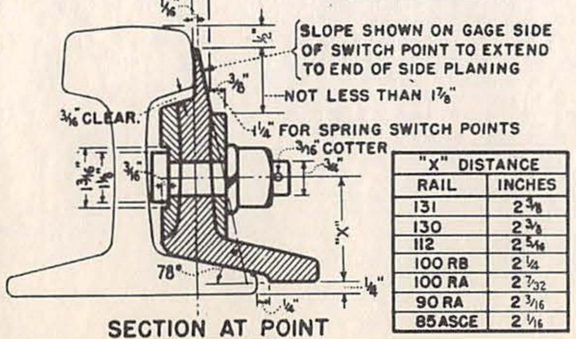

22"
22"
19½"
19½"
19½"
19½"
20"
19"
TIES SPACED APPROX. 20" C/C
RIGID RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
22 22
26 27
HEEL BLOCK
4'-8½"
℄ NO. 1 ROD 4½" THROW
℄ NO. 2 ROD
HEEL SPREAD
5½" FOR RAILS 100 LB. & LESS
6½" FOR RAILS OVER 100 LBS.
FOOTGUARDS
⅜"×1¾" FOR SECTIONS UNDER 85 LB.
⅜"×2¼" " " 85 LB. TO 100 LB. INCL.
⅜"×3" " " OVER 100 LB.
TWIN TIE HEEL PLATES
HORIZONTAL SECTION OF SWITCH POINT
HEEL BLOCK
WHEN NECESSARY CLOSE SPACE
ADJUSTABLE RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
S-1
S-1
S-1
S-1
S-2
S-1
S-2


TOP CUT - ¾" IN 5'-0"
LEVEL AND ¼" ABOVE STOCK RAIL FOR 3'-0"
VERTICAL BEND 3'-0"
LEVEL 2'-0"
GRIND SHARP
R=1½"
TOP OF STOCK RAIL
GROOVE 1³⁄₁₆" WIDE X ³⁄₁₆" DEEP X 3'-7" LONG (STOCK RAIL SIDE, REINFORCING BAR)
TOP OF STOCK RAIL
REINFORCING BAR ⅜" X 9'-1½"
DRILLING TO BE SPECIFIED
½"
¼"
2"
¼"
¹³⁄₁₆" HOLES
1/4"
1½"
BOTTOM OF SWITCH
BOTTOM OF STOCK RAIL
¹³⁄₁₆" HOLES FOR ¾" BOLTS● AND ¾" RIVETS© ON ℄ OF WEB
5"
5"
5"
14"
5"
5"
12⅜"
12⅜"
12⅜"
12⅜"
12½"
5"
27½"

ELEVATION OF SWITCH RAIL


¹³⁄₁₆" ϕ
2¼"
1⅛"
1"
5"
1"
⅝"
VARIABLE

STOP


APPROXIMATE ℄ OF WEB AND GAGE LINE OF STOCK RAIL
9/32"
1/16"
½"
SLOPE SHOWN ON GAGE SIDE OF SWITCH POINT TO EXTEND TO END OF SIDE PLANING
⅜"
NOT LESS THAN 1⅞"
³⁄₁₆" CLEAR.
1¼" FOR SPRING SWITCH POINTS
³⁄₁₆" COTTER
¾"
1³⁄₁₆"
1⅛"
³⁄₁₆"
"X"
78°
¼"
¼"

"X" DISTANCE	
RAIL	INCHES
131	2⅜
130	2⅜
112	2 5/16
100 RB	2¼
100 RA	2 7/32
90 RA	2 3/16
85 ASCE	2 1/16

SECTION AT POINT
(BEFORE GRINDING)

SMB

NOTE:

SWITCHES AND PARTS SHALL MEET A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS EXCEPT AS MAY BE NOTED ON THIS PLAN.

SEE SEPARATE PLANS FOR DETAILS OF SWITCH PLATES, GAUGE PLATES, BRACES, SWITCH RODS AND BOLTS, SWITCH CLIPS, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

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REQUISITION FOR SWITCH COMPLETE WILL SPECIFY INTERLOCKED OR NON-INTERLOCKED, INSULATED OR NON-INSULATED, TYPE OF BRACES, ADJUSTABLE OR RIGID; AND SHOW AS A SEPARATE ITEM, THE HEEL BLOCKS AND TWIN TIE HEEL PLATES REQUIRED. THE WEIGHT AND SECTION OF RAIL AND JOINT BAR DRILLING SHOULD ALWAYS BE SHOWN. HEEL BLOCKS WILL GENERALLY BE USED WITH ALL SWITCHES EXCEPT IN LIGHT TRAFFIC LINES AND SIDINGS.

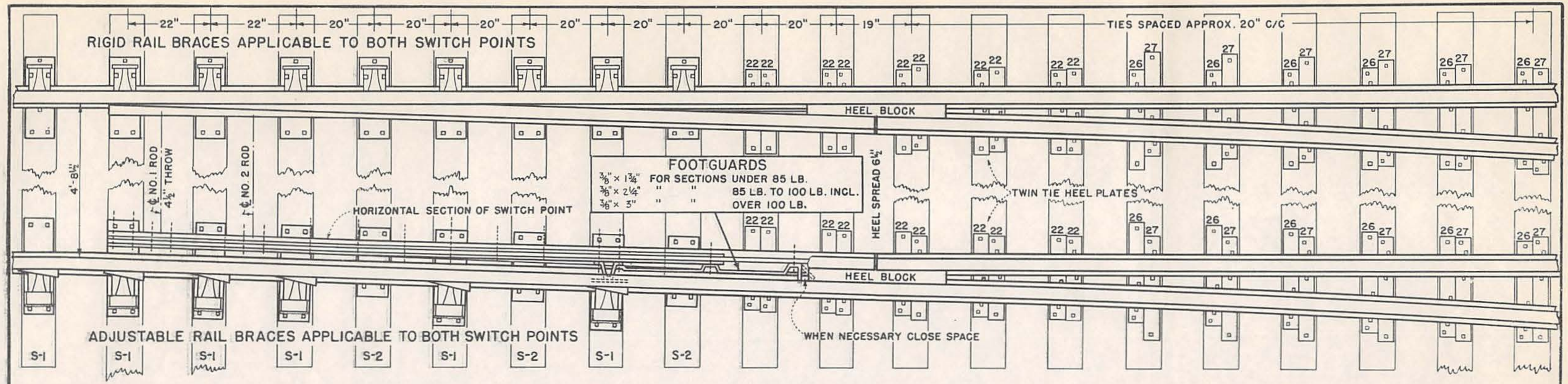
APPROVED- CBHaworth
Chief Engineer Maintenance

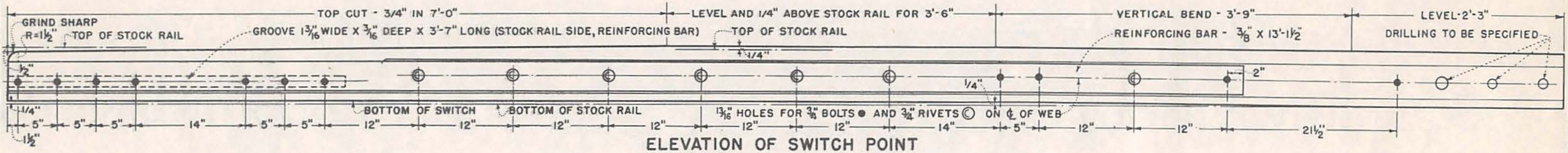
APPROVED- AClarke
Chief Engineer

APPROVED- CWVanHorn
Vice President, Operation & Maintenance

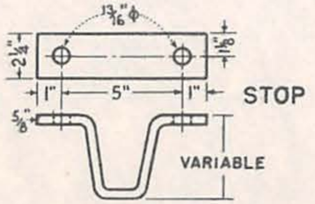
BALTIMORE & OHIO RAILROAD
13 FT. SPLIT SWITCH
Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

36053
50J-74

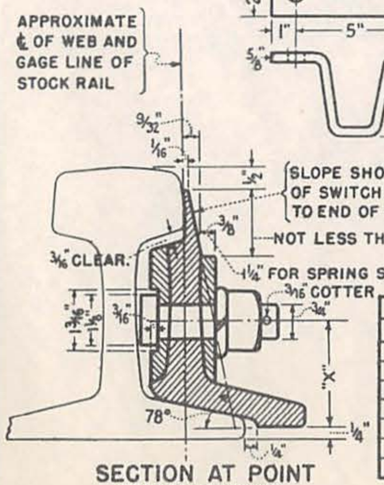

22" 22" 20" 20" 20" 20" 20" 20" 20" 19"
TIES SPACED APPROX. 20" C/C
RIGID RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
22 22
26 27
HEEL BLOCK
4'-8½"
℄ NO. 1 ROD
4½" THROW
℄ NO. 2 ROD
FOOTGUARDS
⅜" × 1¾" FOR SECTIONS UNDER 85 LB.
⅜" × 2¼" " " 85 LB. TO 100 LB. INCL.
⅜" × 3" " " OVER 100 LB.
HEEL SPREAD 6¼"
TWIN TIE HEEL PLATES
HORIZONTAL SECTION OF SWITCH POINT
WHEN NECESSARY CLOSE SPACE
ADJUSTABLE RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
S-1 S-1 S-1 S-1 S-2 S-1 S-2 S-1 S-2


GRIND SHARP
R=1½"
TOP OF STOCK RAIL
TOP CUT - 3/4" IN 7'-0"
GROOVE 1³⁄₁₆" WIDE X ³⁄₁₆" DEEP X 3'-7" LONG (STOCK RAIL SIDE, REINFORCING BAR)
TOP OF STOCK RAIL
LEVEL AND 1/4" ABOVE STOCK RAIL FOR 3'-6"
1/4"
VERTICAL BEND - 3'-9"
REINFORCING BAR - ⅜" X 13'-1½"
LEVEL-2'-3"
DRILLING TO BE SPECIFIED
2"
½"
1/4"
BOTTOM OF SWITCH
BOTTOM OF STOCK RAIL
¹³⁄₁₆" HOLES FOR ¾" BOLTS ● AND ¾" RIVETS © ON ℄ OF WEB
5" 5" 5" 14" 5" 5" 12" 12" 12" 12" 12" 12" 14" 5" 12" 12" 21½"
1½"

ELEVATION OF SWITCH POINT


¹³⁄₁₆" ɸ
2¼"
⅝"
1" 5" 1"
⅝"
VARIABLE

STOP


APPROXIMATE ℄ OF WEB AND GAGE LINE OF STOCK RAIL
9/32"
1/16"
½"
SLOPE SHOWN ON GAGE SIDE OF SWITCH POINT TO EXTEND TO END OF SIDE PLANING
⅜"
NOT LESS THAN 1⅞"
³⁄₁₆" CLEAR.
1¼" FOR SPRING SWITCH POINTS
³⁄₁₆" COTTER
¾"
1³⁄₁₆"
1⅛"
³⁄₁₆"
"X"
78°
¼"
¼"

SECTION AT POINT
(BEFORE GRINDING)

"X" DISTANCE	
RAIL	INCHES
131	2⅜
130	2⅜
112	2 5/16
100 RB	2¼
100 RA	2 7/32
90 RA	2 3/16
85ASCE	2 1/16

SMB

NOTE:

SWITCHES AND PARTS SHALL MEET A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS EXCEPT AS MAY BE NOTED ON THIS PLAN.

SEE SEPARATE PLANS FOR DETAILS OF SWITCH PLATES, GAUGE PLATES, BRACES, SWITCH RODS AND BOLTS, SWITCH CLIPS, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

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SWITCHES WITH ADJUSTABLE BRACES WILL GENERALLY BE USED ON ALL HIGH SPEED AND HEAVY TRAFFIC LINES, AND ON LADDER TRACKS IN HEAVY TRAFFIC YARDS WHERE SWITCHES ARE OF HEAVY RAIL SECTIONS. RIGID OR NON-ADJUSTABLE BRACES WILL BE USED ON ALL OTHER TURNOUTS.

SPRING SWITCHES AND FITTINGS WILL BE IDENTICAL WITH STANDARD SWITCH AS SHOWN ON THIS PLAN EXCEPT THE REINFORCING BAR ON GAUGE SIDE OF POINT WILL BE 1-1/4" THICK INSTEAD OF 3/8" AND WILL BE BOLTED TO POINT INSTEAD OF RIVETED, AND SWITCH RODS DRILLED TO CONFORM TO EXTRA THICK REINFORCING BAR.

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APPROVED- C.B. Hawes
Chief Engineer Maintenance

APPROVED- A.C. Clarke
Chief Engineer

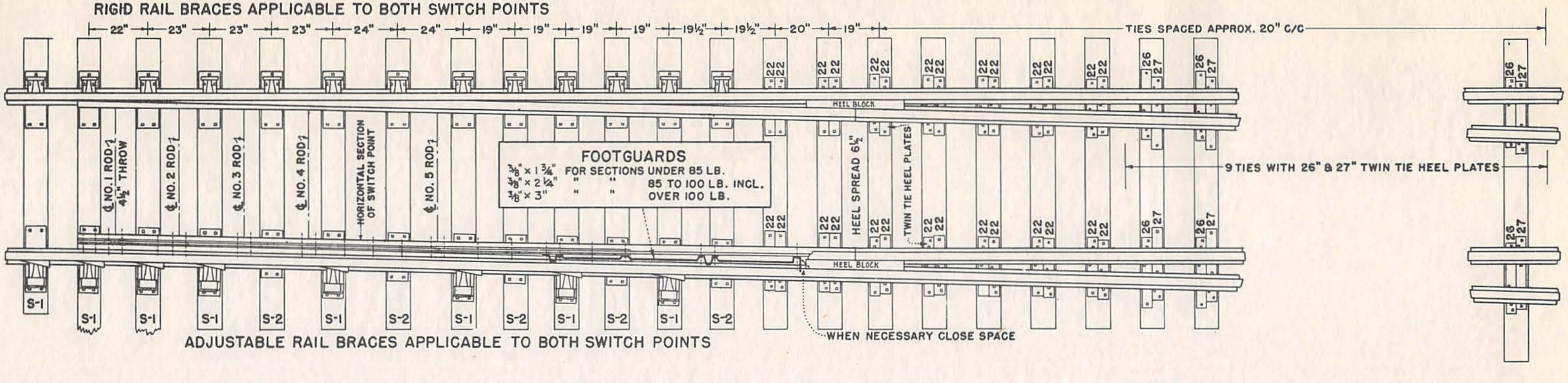
APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

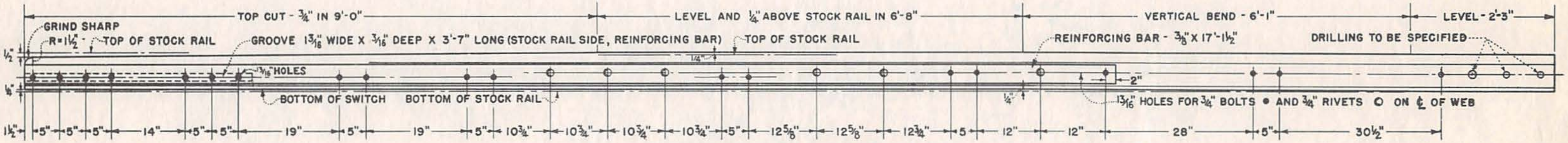
BALTIMORE & OHIO RAILROAD

16½ FT. SPLIT SWITCH

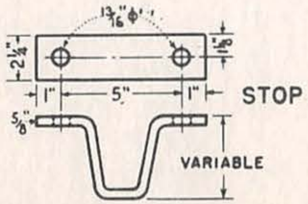
Office of Chief Engineer Maintenance
Baltimore, Md.
April 9, 1946

36054
50J-75

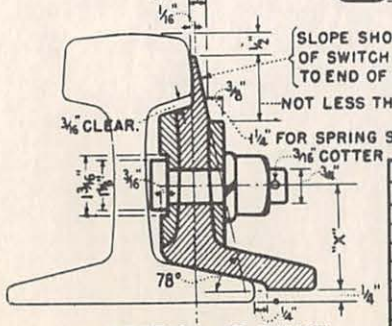

RIGID RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
22" 23" 23" 23" 24" 24" 19" 19" 19" 19" 19½" 19½" 20" 19"
TIES SPACED APPROX. 20" C/C
22 22
26 27
HEEL BLOCK
℄ NO. 1 ROD
4½" THROW
℄ NO. 2 ROD
℄ NO. 3 ROD
℄ NO. 4 ROD
HORIZONTAL SECTION OF SWITCH POINT
℄ NO. 5 ROD
FOOTGUARDS
⅜" × 1¾" FOR SECTIONS UNDER 85 LB.
⅜" × 2¼" " " 85 TO 100 LB. INCL.
⅜" × 3" " " OVER 100 LB.
HEEL SPREAD 6½"
TWIN TIE HEEL PLATES
9 TIES WITH 26" & 27" TWIN TIE HEEL PLATES
S-1 S-1 S-1 S-1 S-2 S-1 S-2 S-1 S-2 S-1 S-2 S-1 S-2
WHEN NECESSARY CLOSE SPACE
ADJUSTABLE RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS


TOP CUT - ¾" IN 9'-0"
LEVEL AND ¼" ABOVE STOCK RAIL IN 6'-8"
VERTICAL BEND - 6'-1"
LEVEL - 2'-3"
GRIND SHARP
R = 1½"
TOP OF STOCK RAIL
GROOVE 13/16" WIDE X 3/16" DEEP X 3'-7" LONG (STOCK RAIL SIDE, REINFORCING BAR)
TOP OF STOCK RAIL
REINFORCING BAR - ⅜" X 17'-1½"
DRILLING TO BE SPECIFIED
½"
⅛"
¼"
3/16" HOLES
BOTTOM OF SWITCH
BOTTOM OF STOCK RAIL
¼"
2"
13/16" HOLES FOR ¾" BOLTS ● AND ¾" RIVETS ○ ON ℄ OF WEB
1½" 5" 5" 5" 14" 5" 5" 19" 5" 19" 5" 10¾" 10¾" 10¾" 10¾" 5" 12⅝" 12⅝" 12¾" 5 12" 12" 28" 5" 30½"

ELEVATION OF SWITCH POINT


13/16" φ
2¼"
1"
5"
1"
⅝"
VARIABLE

STOP


APPROXIMATE ℄ OF WEB AND GAGE LINE OF STOCK RAIL
9/32"
1/16"
SLOPE SHOWN ON GAGE SIDE OF SWITCH POINT TO EXTEND TO END OF SIDE PLANING
⅜"
NOT LESS THAN 1⅞"
3/16" CLEAR.
1¼" FOR SPRING SWITCH POINTS
3/16" COTTER
"X"
78°
¼"
¼"

"X" DISTANCE	
RAIL	INCHES
131	2 3/8
130	2 3/8
112	2 5/16
100 RB	2 1/4
100 RA	2 7/32
90 RA	2 3/16
85 ASCE	2 1/16

SECTION AT POINT
(BEFORE GRINDING)

NOTE:-

SWITCHES AND PARTS SHALL MEET A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS EXCEPT AS MAY BE NOTED ON THIS PLAN.

SEE SEPARATE PLANS FOR DETAILS OF SWITCH PLATES, GAUGE PLATES, BRACES, SWITCH RODS AND BOLTS, SWITCH CLIPS, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

SWITCH POINTS FOR RAIL SECTIONS 100# AND OVER WILL HAVE PROPER HOLE REAMED TO PROVIDE FOR PIPE THIMBLE - 1-9/16" DIAMETER FOR 1" AND 1-1/16" BOLTS, AND 1-3/4" FOR 1-1/8" BOLTS.

ALL WEB BOLTS FOR CLIPS, STOPS AND FOOT GUARDS TO BE 3/4" DIAMETER WITH REGULAR SQUARE HEAD, HEAVY SQUARE NUT, AND WITH SPRING WASHER AND 3/16" COTTER.

SWITCHES WITH ADJUSTABLE BRACES WILL GENERALLY BE USED ON ALL HIGH SPEED AND HEAVY TRAFFIC LINES, AND ON LADDER TRACKS IN HEAVY TRAFFIC YARDS WHERE SWITCHES ARE OF HEAVY RAIL SECTIONS. RIGID OR NON-ADJUSTABLE BRACES WILL BE USED ON ALL OTHER TURNOUTS.

SPRING SWITCHES AND FITTINGS WILL BE IDENTICAL WITH STANDARD SWITCH AS SHOWN ON THIS PLAN EXCEPT THE REINFORCING BAR ON GAUGE SIDE OF POINT WILL BE 1-1/4" THICK INSTEAD OF 3/8" AND WILL BE BOLTED TO POINT INSTEAD OF RIVETED, AND SWITCH RODS DRILLED TO CONFORM TO EXTRA THICK REINFORCING BAR.

AT INTERLOCKED AND SPRING SWITCHES, GAUGE PLATES WITH ADJUSTABLE BRACES WILL BE USED AS SHOWN ON GAUGE PLATE PLAN.

A COMPLETE SWITCH WILL INCLUDE POINTS WITH CLIPS, RODS, FOOT GUARDS, PLATES, BRACES, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

REQUISITION FOR SWITCH COMPLETE WILL SPECIFY INTERLOCKED OR NON-INTERLOCKED, INSULATED OR NON-INSULATED, TYPE OF BRACES, ADJUSTABLE OR RIGID; AND SHOW AS A SEPARATE ITEM, THE HEEL BLOCKS AND TWIN TIE HEEL PLATES REQUIRED. THE WEIGHT AND SECTION OF RAIL AND JOINT BAR DRILLING SHOULD ALWAYS BE SHOWN. HEEL BLOCKS WILL GENERALLY BE USED WITH ALL SWITCHES EXCEPT IN LIGHT TRAFFIC LINES AND SIDINGS.

APPROVED- C.B. Hauser
Chief Engineer Maintenance

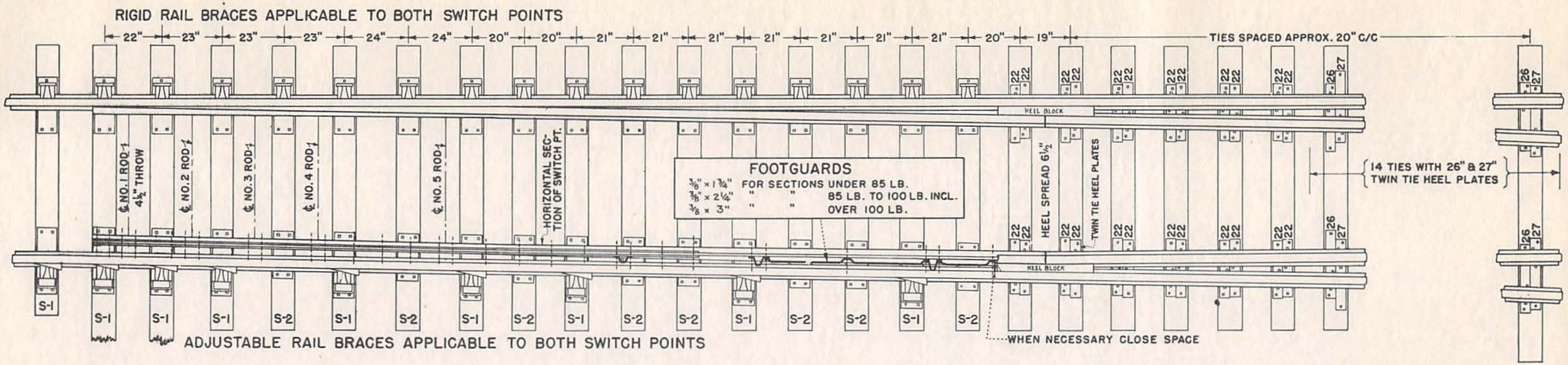
APPROVED- A.C. Clarke
Chief Engineer

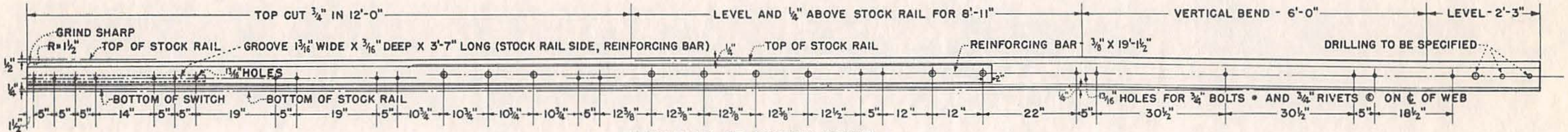
APPROVED- C.W. Van Horn
Vice President, Operation & Maintenance

BALTIMORE & OHIO RAILROAD
24 FT. SPLIT SWITCH
Office of Chief Engineer Maintenance
Baltimore, Md.
Sept. 9, 1946

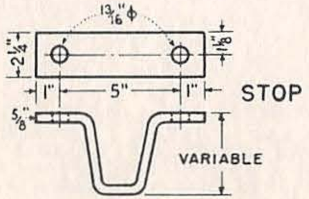
SMB

36055
50J-76

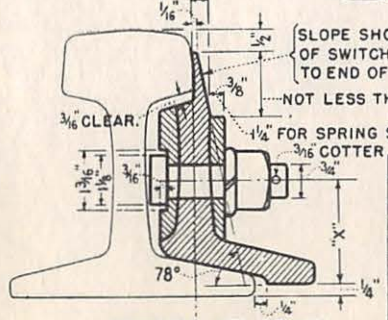

RIGID RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
22" 23" 23" 23" 24" 24" 20" 20" 21" 21" 21" 21" 21" 21" 21" 20" 19"
TIES SPACED APPROX. 20" C/C
¢ NO. 1 ROD 4½" THROW
¢ NO. 2 ROD
¢ NO. 3 ROD
¢ NO. 4 ROD
¢ NO. 5 ROD
HORIZONTAL SECTION OF SWITCH PT.
FOOTGUARDS
3/8" × 1¾" FOR SECTIONS UNDER 85 LB.
3/8" × 2¼" " " 85 LB. TO 100 LB. INCL.
3/8 × 3" " " OVER 100 LB.
HEEL BLOCK
HEEL SPREAD 6½"
TWIN TIE HEEL PLATES
22 22
26 27
14 TIES WITH 26" & 27" TWIN TIE HEEL PLATES
S-1 S-1 S-1 S-1 S-2 S-1 S-2 S-1 S-2 S-1 S-2 S-2 S-1 S-2 S-2 S-1 S-2
ADJUSTABLE RAIL BRACES APPLICABLE TO BOTH SWITCH POINTS
WHEN NECESSARY CLOSE SPACE


TOP CUT 3/4" IN 12'-0"
LEVEL AND 1/4" ABOVE STOCK RAIL FOR 8'-11"
VERTICAL BEND - 6'-0"
LEVEL - 2'-3"
GRIND SHARP
R=1½"
TOP OF STOCK RAIL
GROOVE 13/16" WIDE X 3/16" DEEP X 3'-7" LONG (STOCK RAIL SIDE, REINFORCING BAR)
1/4"
TOP OF STOCK RAIL
REINFORCING BAR - 3/8" X 19'-1½"
DRILLING TO BE SPECIFIED
13/16" HOLES
½"
¼"
1½"
BOTTOM OF SWITCH
BOTTOM OF STOCK RAIL
2"
13/16" HOLES FOR 3/4" BOLTS • AND 3/4" RIVETS © ON ¢ OF WEB
5" 5" 5" 14" 5" 5" 19" 5" 19" 5" 10¾" 10¾" 10¾" 10¾" 5" 12⅜" 12⅜" 12⅜" 12⅜" 12½" 5" 12" 12" 22" 5" 30½" 30½" 5" 18½"

ELEVATION OF SWITCH POINT


13/16" φ
2¼"
1/8"
1" 5" 1"
5/8"
VARIABLE

STOP


APPROXIMATE ¢ OF WEB AND GAGE LINE OF STOCK RAIL
9/32"
1/16"
½"
SLOPE SHOWN ON GAGE SIDE OF SWITCH POINT TO EXTEND TO END OF SIDE PLANING
3/8"
NOT LESS THAN 1⅞".
3/16" CLEAR.
1¼" FOR SPRING SWITCH POINTS
3/16" COTTER
3/4"
1 3/16"
1 1/16"
3/8"
"X"
78°
1/4"
1/4"

SECTION AT POINT
(BEFORE GRINDING)

"X" DISTANCE	
RAIL	INCHES
131	2⅜
130	2⅜
112	2 5/16
100 RB	2¼
100 RA	2 7/32
90 RA	2 3/16
85 ASCE	2 1/16

NOTE:

SWITCHES AND PARTS SHALL MEET A.R.E.A. STANDARD TRACK WORK SPECIFICATIONS EXCEPT AS MAY BE NOTED ON THIS PLAN.

SEE SEPARATE PLANS FOR DETAILS OF SWITCH PLATES, GAUGE PLATES, BRACES, SWITCH RODS AND BOLTS, SWITCH CLIPS, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

SWITCH POINTS FOR RAIL SECTIONS 100# AND OVER WILL HAVE PROPER HOLE REAMED TO PROVIDE FOR PIPE THIMBLE - 1-9/16" DIAMETER FOR 1" AND 1-1/16" BOLTS, AND 1-3/4" FOR 1-1/8" BOLTS.

ALL WEB BOLTS FOR CLIPS, STOPS AND FOOT GUARDS TO BE 3/4" DIAMETER WITH REGULAR SQUARE HEAD, HEAVY SQUARE NUT, AND WITH SPRING WASHER AND 3/16" COTTER.

SWITCHES WITH ADJUSTABLE BRACES WILL GENERALLY BE USED ON ALL HIGH SPEED AND HEAVY TRAFFIC LINES, AND ON LADDER TRACKS IN HEAVY TRAFFIC YARDS WHERE SWITCHES ARE OF HEAVY RAIL SECTIONS. RIGID OR NON-ADJUSTABLE BRACES WILL BE USED ON ALL OTHER TURNOUTS.

SPRING SWITCHES AND FITTINGS WILL BE IDENTICAL WITH STANDARD SWITCH AS SHOWN ON THIS PLAN EXCEPT THE REINFORCING BAR ON GAUGE SIDE OF POINT WILL BE 1-1/4" THICK INSTEAD OF 3/8" AND WILL BE BOLTED TO POINT INSTEAD OF RIVETED, AND SWITCH RODS DRILLED TO CONFORM TO EXTRA THICK REINFORCING BAR.

AT INTERLOCKED AND SPRING SWITCHES, GAUGE PLATES WITH ADJUSTABLE BRACES WILL BE USED AS SHOWN ON GAUGE PLATE PLAN.

A COMPLETE SWITCH WILL INCLUDE POINTS WITH CLIPS, RODS, FOOT GUARDS, PLATES, BRACES, HEEL BLOCKS AND TWIN TIE HEEL PLATES.

REQUISITION FOR SWITCH COMPLETE WILL SPECIFY INTERLOCKED OR NON-INTERLOCKED, INSULATED OR NON-INSULATED, TYPE OF BRACES, ADJUSTABLE OR RIGID; AND SHOW AS A SEPARATE ITEM, THE HEEL BLOCKS AND TWIN TIE HEEL PLATES REQUIRED. THE WEIGHT AND SECTION OF RAIL AND JOINT BAR DRILLING SHOULD ALWAYS BE SHOWN. HEEL BLOCKS WILL GENERALLY BE USED WITH ALL SWITCHES EXCEPT IN LIGHT TRAFFIC LINES AND SIDINGS.

APPROVED-
Chief Engineer Maintenance

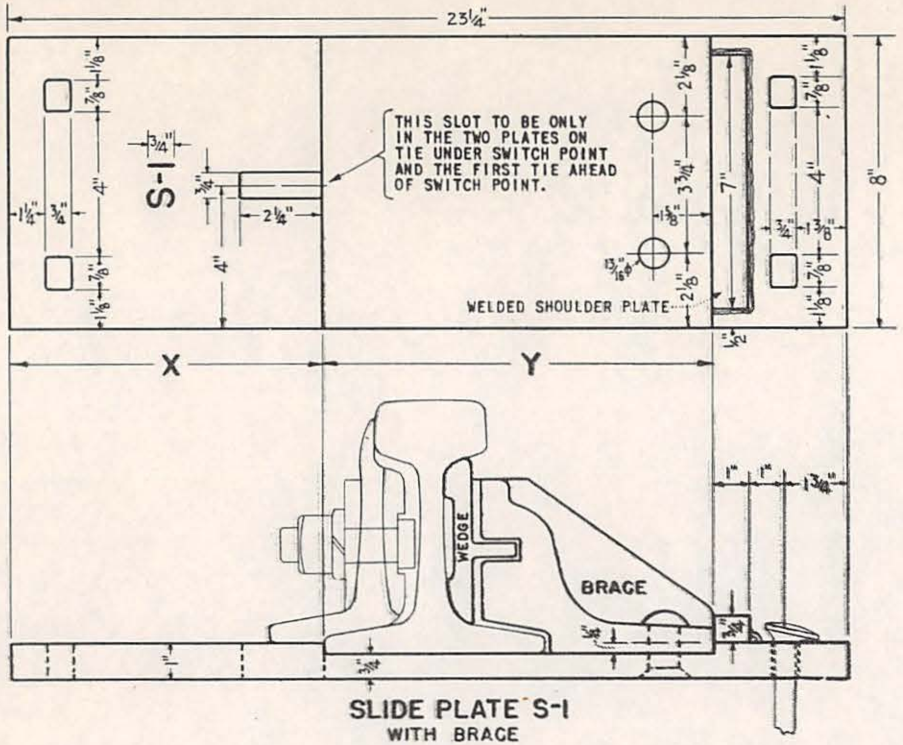
APPROVED-
Chief Engineer

APPROVED- CW Van Horn
Vice President, Operation & Maintenance

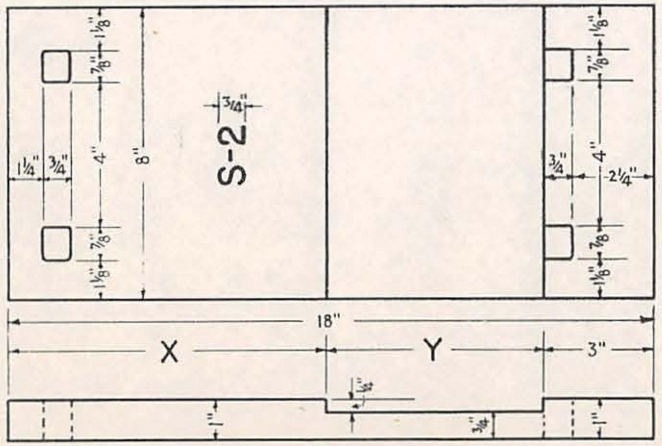
BALTIMORE & OHIO RAILROAD
30 FT. SPLIT SWITCH
Office of Chief Engineer Maintenance
Baltimore, Md.
Sept. 9, 1946

36056
50J-77

SWB



SLIDE PLATE S-1
WITH BRACE



SLIDE PLATE S-2

"X" AND "Y" DIMENSIONS - INCHES

WEIGHT & SECTION OF RAIL	SLIDE PLATE S-1		SLIDE PLATE S-2	
	X	Y	X	Y
90 ASCE	9-3/8	10-1/8	9-9/16	5-7/16
90 RA	9-5/8	9-7/8	9-51/64	5-13/64
100 RA	9-1/4	10-1/4	9-7/16	5-9/16
100 RB	9-5/8	9-7/8	9-51/64	5-13/64
100 ASCE	9-	10-1/2	9-3/16	5-13/16
112 RE	9-1/4	10-1/4	9-7/16	5-9/16
115 RE	9-1/4	10-1/4	9-7/16	5-9/16
130 RE	8-3/4	10-3/4	8-15/16	6-1/16
131 RE	8-3/4	10-3/4	8-15/16	6-1/16
133 RE	8-3/4	10-3/4	8-15/16	6-1/16

ADJUSTABLE SWITCH BRACES
TABLE OF REFERENCES

WEIGHT & SECTION OF RAIL	REQUISITION TO SPECIFY
90 ASCE	P.R.A. CO. PLAN NO. 8925
90 RA	" " " " 8747
100 RA	" " " " 8832
100 RB	" " " " 8571
100 ASCE	" " " " 8834
112 RE	" " " " 8808-B
115 RE	" " " "
130 RE	" " " " 8548-1
131 RE	" " " " 8809-D
133 RE	" " " "

TABLE OF PLATES AND BRACES REQUIRED

LENGTH OF SWITCH	S-1 PLATES WITH ADJUSTABLE BRACES		S-2 PLATES	ADJUSTABLE BRACES
	WITH SLOT	WITHOUT SLOT		
11'	4	6	2	10
13'	4	6	4	10
16½'	4	8	6	12
24'	4	12	10	15
30'	4	14	16	18

NOTE

PLATES TO BE MADE OF MILD ROLLED STEEL MEETING A.R.E.A. STANDARD TRACKWORK SPECIFICATIONS.

BRACES TO BE MADE OF MALLEABLE IRON OR CAST STEEL MEETING A.R.E.A. STANDARD TRACKWORK SPECIFICATIONS, AND TO P.R.A.CO. PLANS AS GIVEN IN TABLE.

PLATES, BRACES, AND WEDGES TO BE STAMPED WITH MANUFACTURER'S NAME, AND WEIGHT AND SECTION OF RAIL WITH WHICH TO BE USED.

S-1 PLATES MUST HAVE THE ADJUSTABLE BRACE RIVETED TO THE PLATE IN THE SHOP BEFORE SHIPMENT.

REQUISITION FOR PLATES MUST SHOW THE WEIGHT AND SECTION OF RAIL WITH WHICH TO BE USED AND MAY BE ORDERED IN SETS, GIVING LENGTH OF SWITCH, OR AS SEPARATE ITEM GIVING QUANTITY OF EACH PLATE REQUIRED.

S-1 PLATES WITH ADJUSTABLE BRACES ATTACHED AND S-2 PLATES WILL GENERALLY BE FURNISHED FROM MARTINSBURG SHOP.

WHEN BRACES AND WEDGES NOT ATTACHED TO THE S-1 PLATE ARE REQUIRED FOR RENEWALS, THEY WILL BE FURNISHED BY DIVISION STOREKEEPER WHO SHOULD ORDER THEM ON PURCHASE REQUISITION.

SHOULDER PLATE SHALL BE WELDED TO SLIDE PLATE BEFORE PLANING.

SHOULDER OF SLIDE PLATES MAY BE PRESSED, THEN PLANED, WHERE SUCH PROCEDURE IS AUTHORIZED.

FOR LOCATION OF PLATES AND BRACES SEE PLANS OF SPLIT SWITCHES.

APPROVED-
Chief Engineer Maintenance

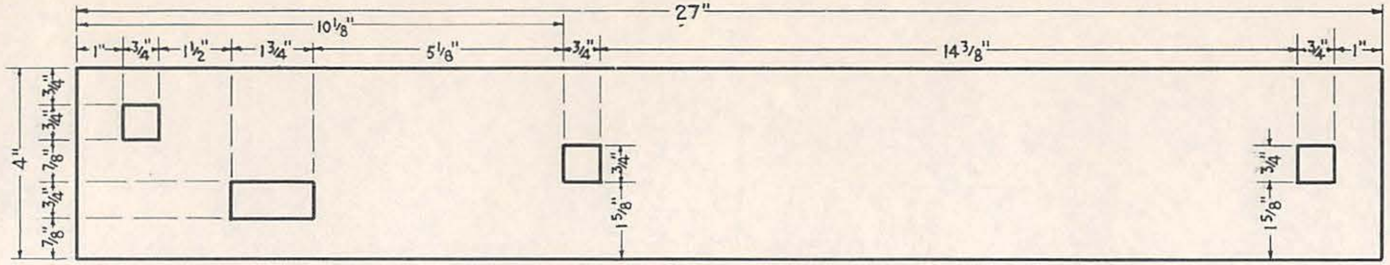
APPROVED-
Chief Engineer

APPROVED- C. W. Van Horn
Vice President, Operation & Maintenance

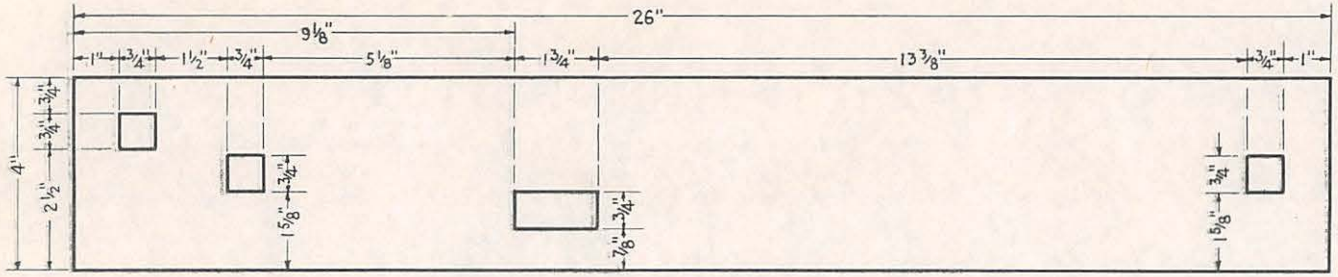
BALTIMORE & OHIO RAILROAD
SWITCH SLIDE PLATES AND ADJUSTABLE BRACES
Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 29, 1946

SMB

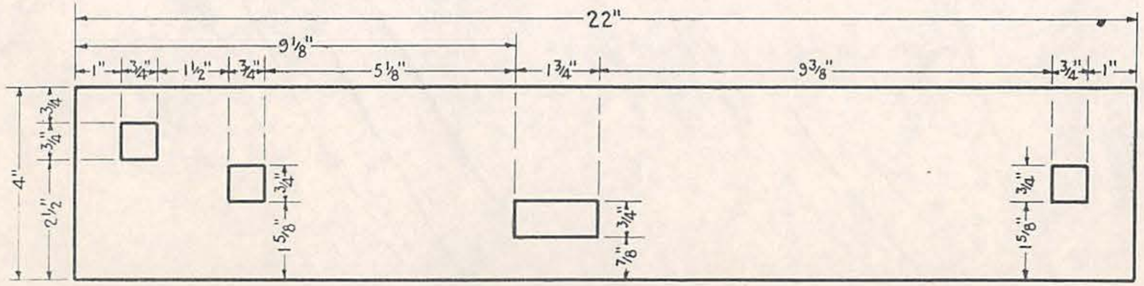
36J77
50J-80


27"
10⅛"
1" ¾" 1½" 1¾" 5⅛" ¾" 14⅜" ¾" 1"
4"
¾" ¾" ⅞" ¾" ⅞"
¾" 1⅝"
¾" 1⅝"

27" TWIN TIE PLATE


26"
9⅛"
1" ¾" 1½" ¾" 5⅛" 1¾" 13⅜" ¾" 1"
4"
¾" ¾" 2½"
¾" 1⅝"
¾" ⅞"
¾" 1⅝"

26" TWIN TIE PLATE


22"
9⅛"
1" ¾" 1½" ¾" 5⅛" 1¾" 9⅜" ¾" 1"
4"
¾" ¾" 2½"
¾" 1⅝"
¾" ⅞"
¾" 1⅝"

22" TWIN TIE PLATE

NOTE

PLATES TO BE MADE OF ROLLED MILD O.H. STEEL MEETING A.R.E.A. STANDARD TRACKWORK SPECIFICATIONS.

ALL PLATES WILL BE 3/4" THICK.

PLATES WILL BE STAMPED WITH MANUFACTURER'S NAME OR TRADE MARK, AND WITH NUMBERS AS INDICATED.

PLATES MAY BE ORDERED IN SETS, SPECIFYING LENGTH OF SWITCH POINTS, OR MAY BE ORDERED AS SEPARATE PLATES SPECIFYING THE NUMBER OF EACH LENGTH REQUIRED.

FOR LOCATION OF TWIN TIE HEEL PLATES SEE PLANS OF SPLIT SWITCHES.

TOELESS TYPE OF JOINT BARS WILL BE REQUIRED AT HEEL OF SWITCH WHEN TWIN TIE HEEL PLATES ARE USED.

PLATES REQUIRED FOR ONE COMPLETE SWITCH

LENGTH OF SWITCH	22" PLATE	26" PLATE	27" PLATE
11 FT.	20	8	8
13 FT.	20	10	10
16½ FT.	20	12	12
24 FT.	28	18	18
30 FT.	24	28	28

APPROVED-
Chief Engineer Maintenance

APPROVED-
Chief Engineer

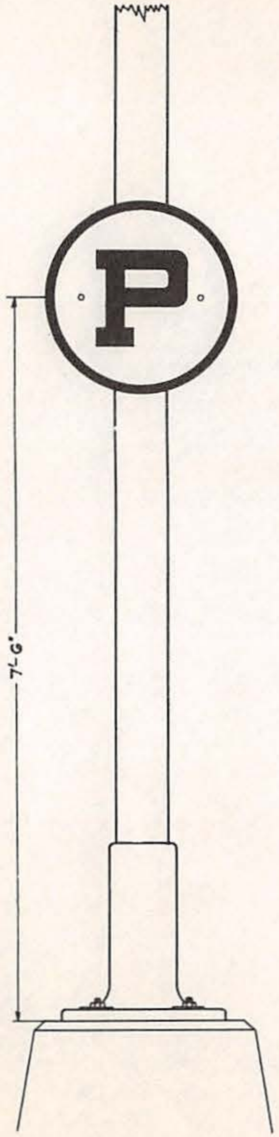
APPROVED- C W Van Horn
Vice President, Operation & Maintenance

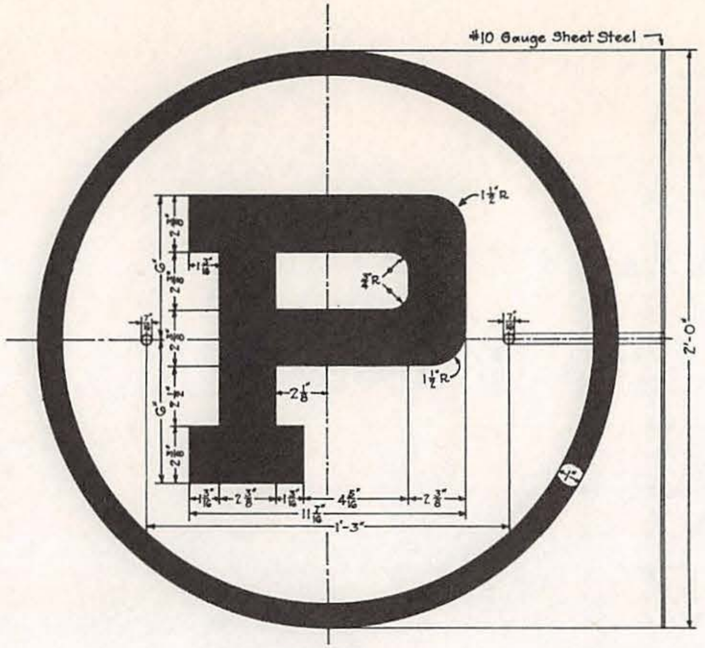
BALTIMORE & OHIO RAILROAD

TWIN TIE HEEL PLATES FOR SWITCHES

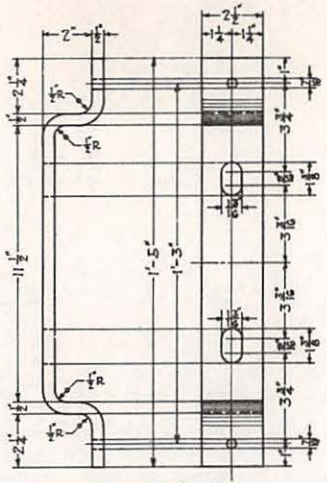
Office of Chief Engineer Maintenance
Baltimore, Md.
Oct. 30, 1946

36080
50J-81

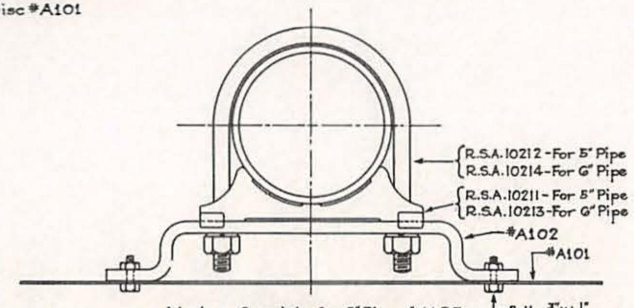



#10 Gauge Sheet Steel
2'-0"
1'-3"
1½"R
1½"R
2⅛"
6"
6"

Disc #A101


2"
2½"
1¼
1¼
2¼"
2¼"
11½"
1'-5"
1'-3"
3¾"
3¾"
½"R
½"R

Bracket #A102

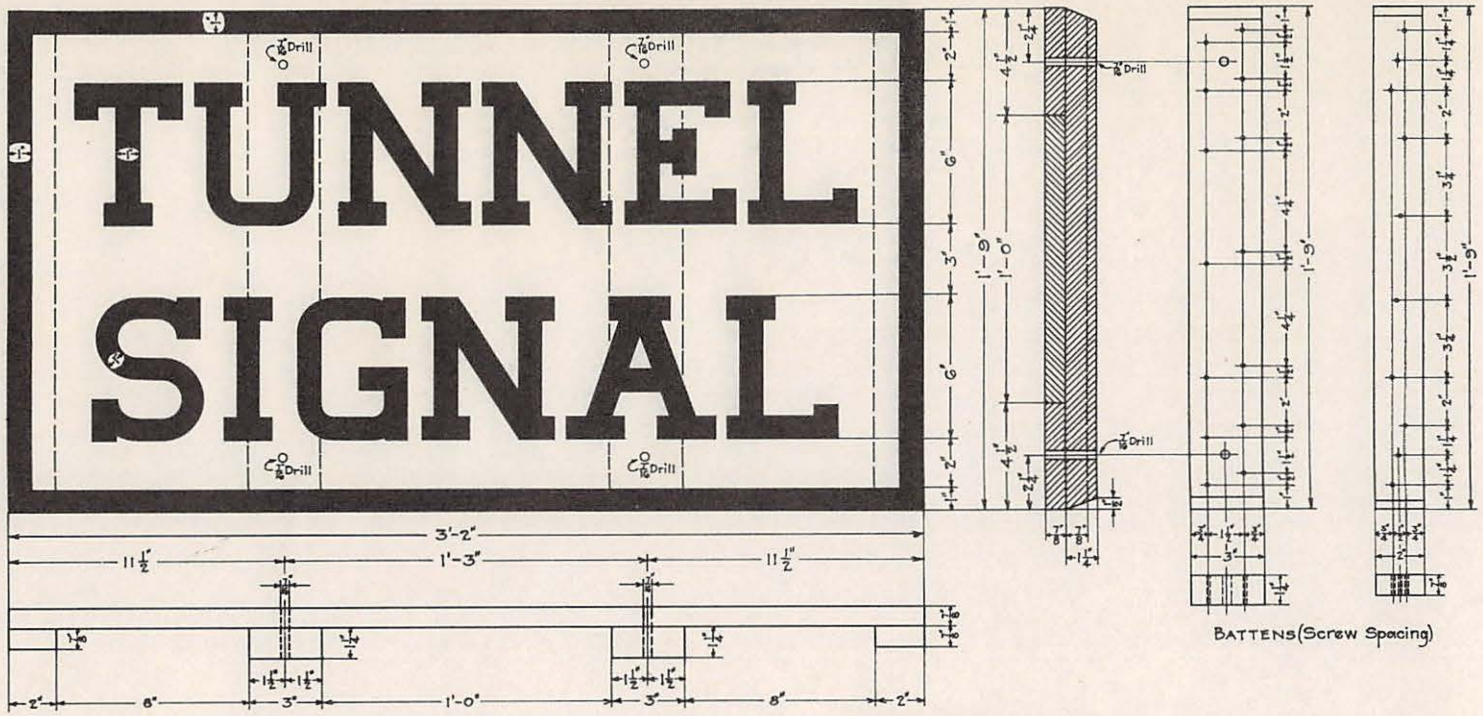

R.S.A.10212 - For 5" Pipe
R.S.A.10214 - For 6" Pipe
R.S.A.10211 - For 5" Pipe
R.S.A.10213 - For 6" Pipe
#A102
#A101
Bolt - ⅜"×1¼"

Marker Complete for 5" Pipe - #A103
Marker Complete for 6" Pipe - #A104

1-Disc shall be made of Open Hearth Steel
and enameled with not less than three (3) coats of Vitreous enamel.
2-Color back of disc - Black.
3-Color face of disc - White.
4-Color of letter "P" - Black.
5-Color of circle - Black.

BALTIMORE & OHIO RAILROAD
PERMISSIVE MARKER
AND METHOD OF APPLICATION
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 16, 1946

A25-1A

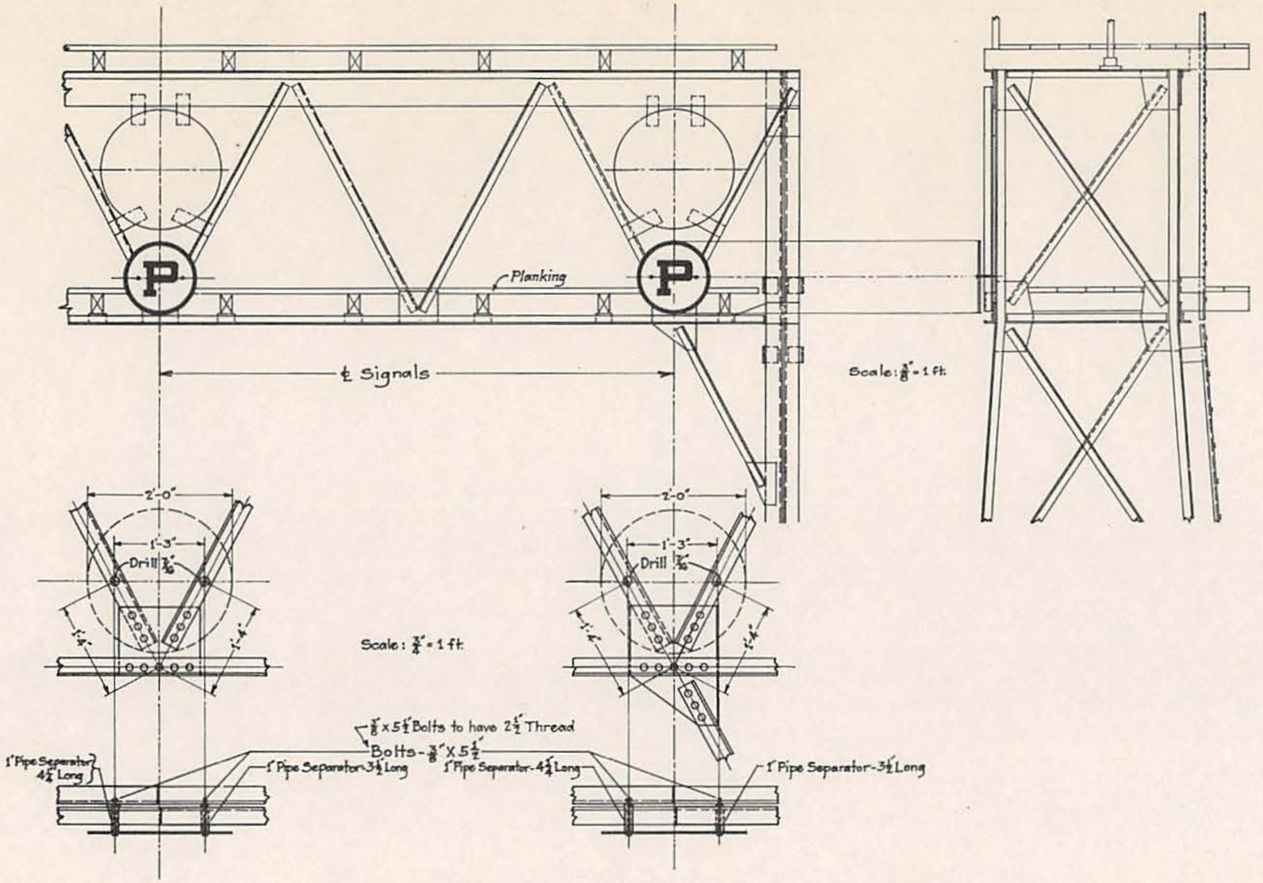

TUNNEL
SIGNAL
Drill
3'-2"
11 1/2"
1'-3"
11 1/2"
2"
8"
3"
1'-0"
3"
8"
2"
1 1/2"
6"
3"
6"
2"
1'-9"
1'-0"
4 1/2"
2 1/4"
3 1/2"
4 1/4"
1 1/4"
3"
2"
1'-9"
BATTENS (Screw Spacing)

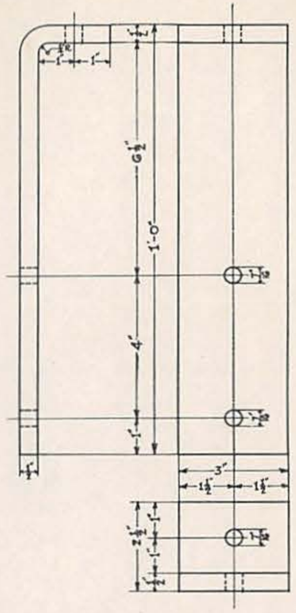
Marker only #A105.
Marker and Fastenings Complete for 5" Mast-#A106.
Marker and Fastenings Complete for 6" Mast-#A107.

Note-
Marker Painting - Back, Black; Face, White; Letters, Black; Border, Black.
Battens to be securely attached with screws.
Marker to be secured to mast with-(Bracket #A102, Clamp #10211 & U-Bolt #10212 for 5" Mast)
or (Bracket #A102, Clamp #10213 & U-Bolt #10214 for 6" Mast).

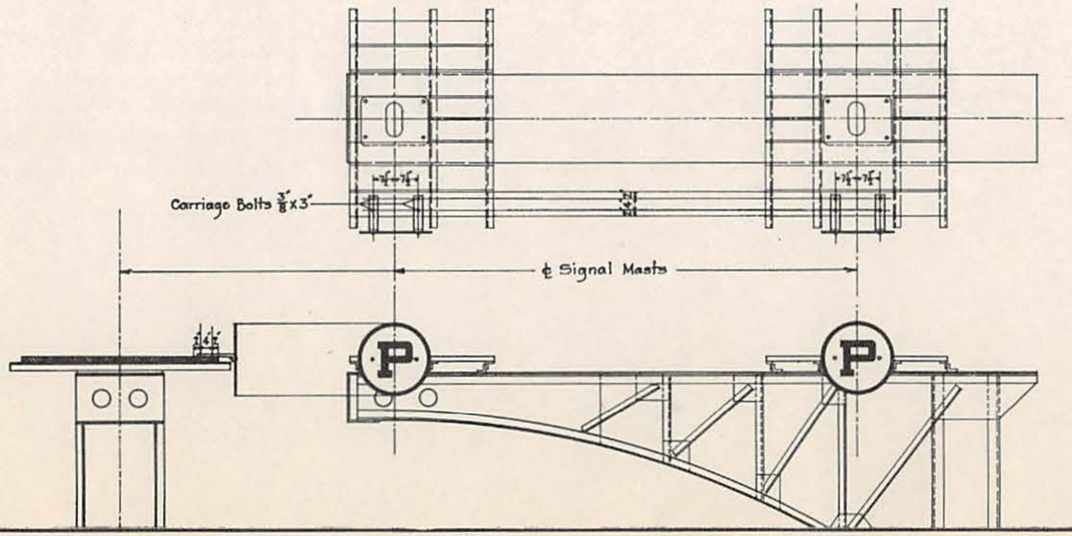
BALTIMORE & OHIO RAILROAD
MARKER FOR TUNNEL SIGNAL
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 11, 1946

A25-1-B


P
P
Planking
℄ Signals
Scale: 3/8" = 1 ft.
2'-0"
1'-3"
Drill 13/16
1'-4"
Scale: 3/4" = 1 ft.
5/8 x 5 1/2 Bolts to have 2 1/2" Thread
Bolts - 5/8" X 5 1/2"
1" Pipe Separator 4 1/2" Long
1" Pipe Separator-3 1/4" Long
1" Pipe Separator-4 3/4" Long
1" Pipe Separator-3 1/4" Long


6 1/2"
1'-0"
4"
3"
1 1/2"
1 1/2"

Bracket #A108 – 2 Reqd. for each Letter "P"
Scale: 3/8" = 1 inch

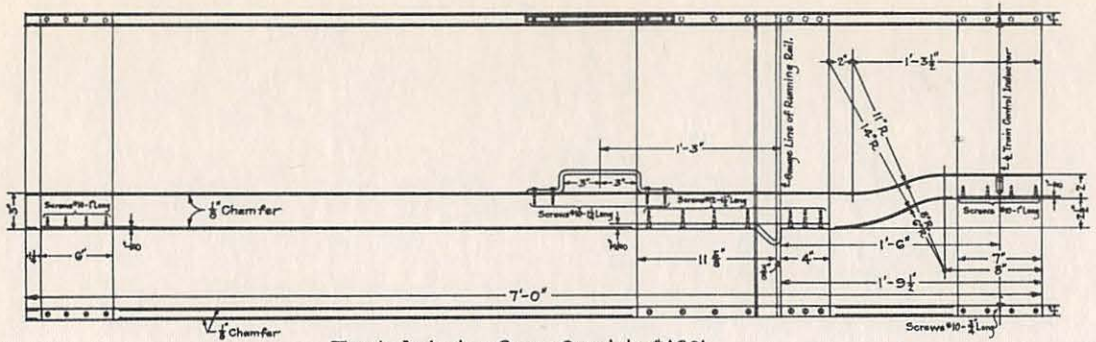

Carriage Bolts 3/8" x 3"
℄ Signal Masts
P
P

BALTIMORE & OHIO RAILROAD

PERMISSIVE MARKER AND METHOD OF APPLICATION

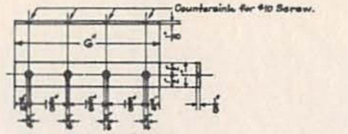
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 16, 1946

A25-1C



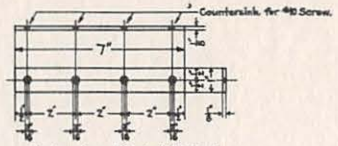
1'-3"
1'-3½"
Gauge Line of Running Rail
C.L. Train Control Inductor
1'-4⅞"
2"
3"
⅛" Chamfer
Screws #10-1" Long
Screws #10-¾" Long
6"
11⅝"
4"
1'-6"
7"
8"
1'-9½"
7'-0"

Track Inductor Gauge-Complete-#A201



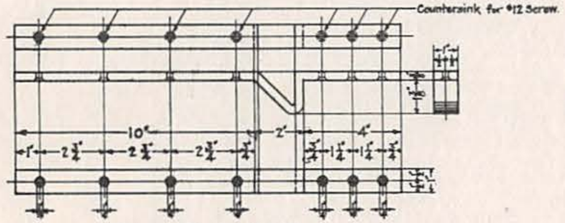
Countersink for #10 Screw.
6"

Rail Plate-#A203



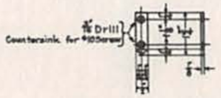
Countersink for #10 Screw.
7"
2"

Inductor Plate #A204



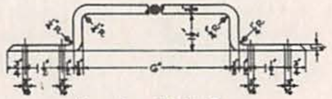
Countersink for #12 Screw.
10"
1"
2¾"
2"
4"
1¼"

Gauge Plate-A202



Drill
Countersink for #10 Screw

Center Plate-#A206

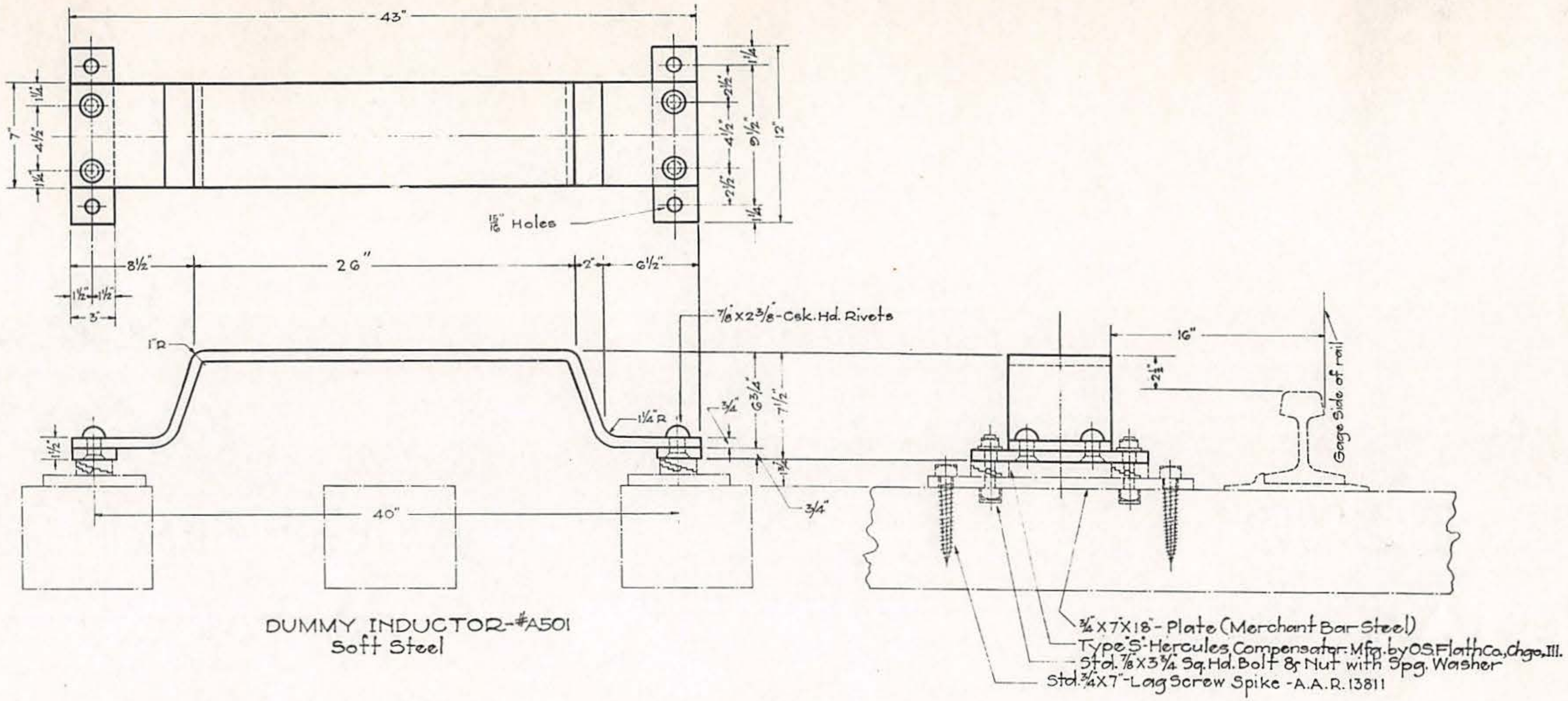


Handle-#A205

Note-
Gauge to be Cypress 'A' Finish; shellaced (2) two coats.
Handle and Plates to be painted Black (2) two coats.

BALTIMORE & OHIO RAILROAD
TRACK INDUCTOR GAUGE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 15, 1946

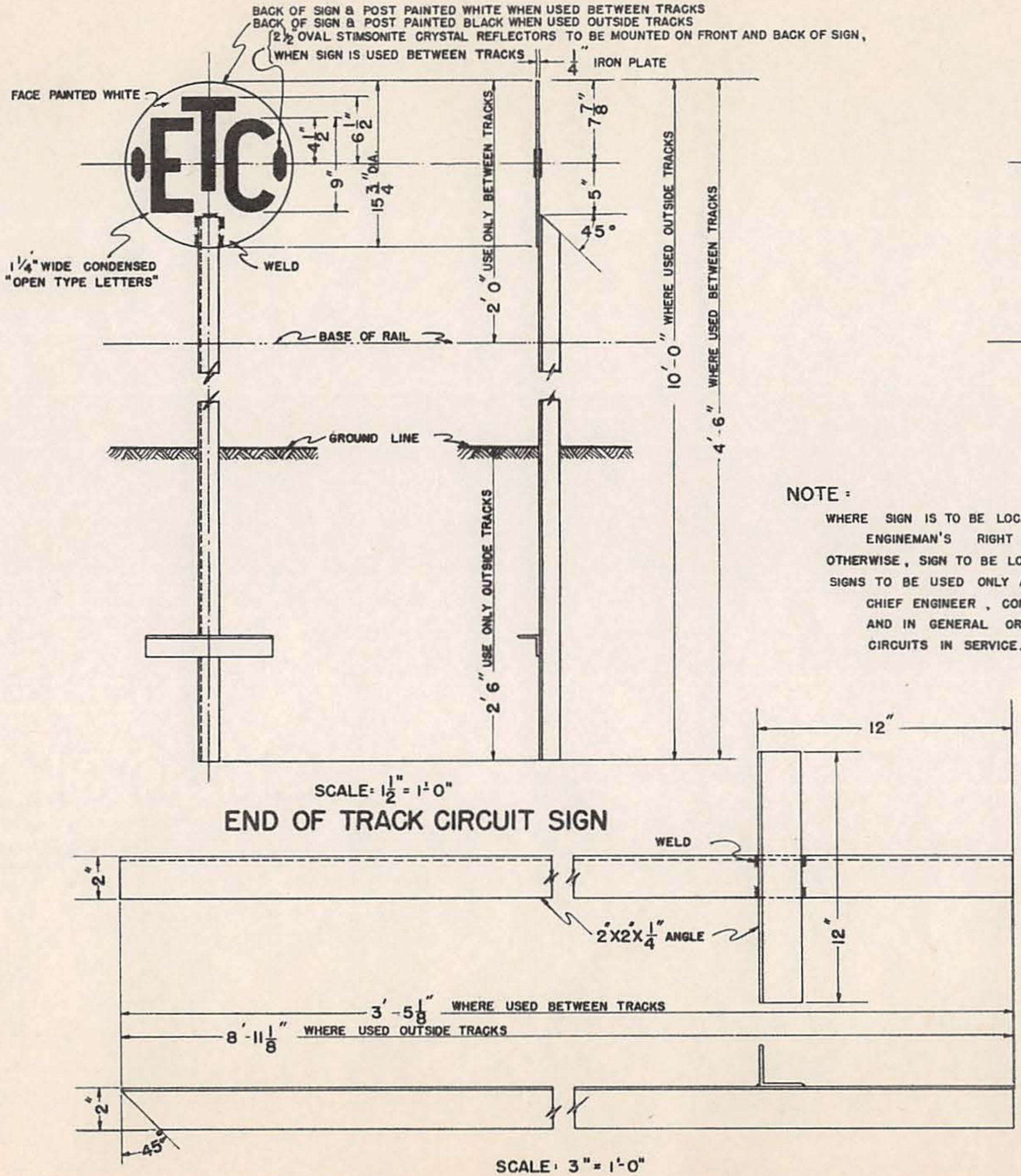
A25-2A


43"
15/16" Holes
1 1/2"
4 1/2"
1 1/4"
7"
1 1/4"
2 1/2"
4 1/2"
2 1/2"
1 1/4"
9 1/2"
12"
8 1/2"
26"
2"
6 1/2"
1 1/2"
1 1/2"
3"
7/8 X 2 3/8 - Csk. Hd. Rivets
1"R
1 1/4"R
3/4"
6 3/4"
7 1/2"
1 1/2"
1 3/4"
3/4"
40"
16"
2 1/4"
Gage Side of rail
3/4" X 7" X 18" - Plate (Merchant Bar Steel)
Type "S" Hercules Compensator. Mfg. by O.S. Flath Co., Chgo., Ill.
Std. 7/8 X 3 3/4 Sq. Hd. Bolt & Nut with Spg. Washer
Std. 3/4 X 7" - Lag Screw Spike - A.A.R. 13811

DUMMY INDUCTOR-#A501
Soft Steel

BALTIMORE & OHIO RAILROAD
DUMMY INDUCTOR
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 14, 1946

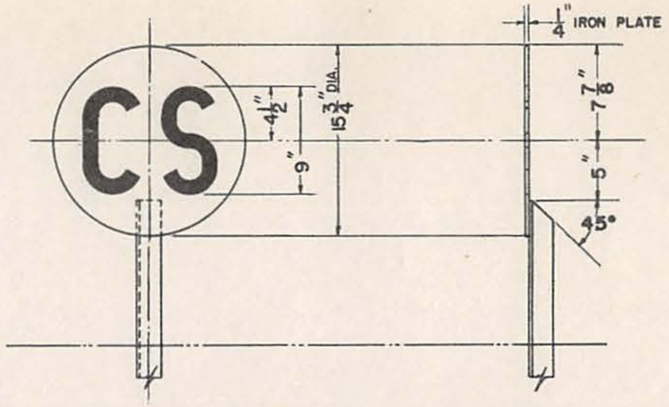
A25-5A


BACK OF SIGN & POST PAINTED WHITE WHEN USED BETWEEN TRACKS
BACK OF SIGN & POST PAINTED BLACK WHEN USED OUTSIDE TRACKS
2½ OVAL STIMSONITE CRYSTAL REFLECTORS TO BE MOUNTED ON FRONT AND BACK OF SIGN, WHEN SIGN IS USED BETWEEN TRACKS
¼" IRON PLATE
FACE PAINTED WHITE
ETC
4½"
6½"
9"
15¼" DIA.
7⅞"
5"
45°
1¼" WIDE CONDENSED "OPEN TYPE LETTERS"
WELD
2'0" USE ONLY BETWEEN TRACKS
10'0" WHERE USED OUTSIDE TRACKS
4'6" WHERE USED BETWEEN TRACKS
BASE OF RAIL
GROUND LINE
2'6" USE ONLY OUTSIDE TRACKS
12"
WELD
2"
2"X2"X¼" ANGLE
12"
3'-5⅛" WHERE USED BETWEEN TRACKS
8'-11⅛" WHERE USED OUTSIDE TRACKS
2"
45°

SCALE: 1½" = 1'-0"

END OF TRACK CIRCUIT SIGN

SCALE: 3" = 1'-0"


¼" IRON PLATE
CS
4½"
9"
15¾" DIA.
7⅞"
5"
45°

PAINTING, LETTERS, CONSTRUCTION AND LOCATING TO BE THE SAME AS E.T.C. SIGN

CUT SECTION SIGN
(USED ONLY ON SPECIAL INSTRUCTIONS)

NOTE:

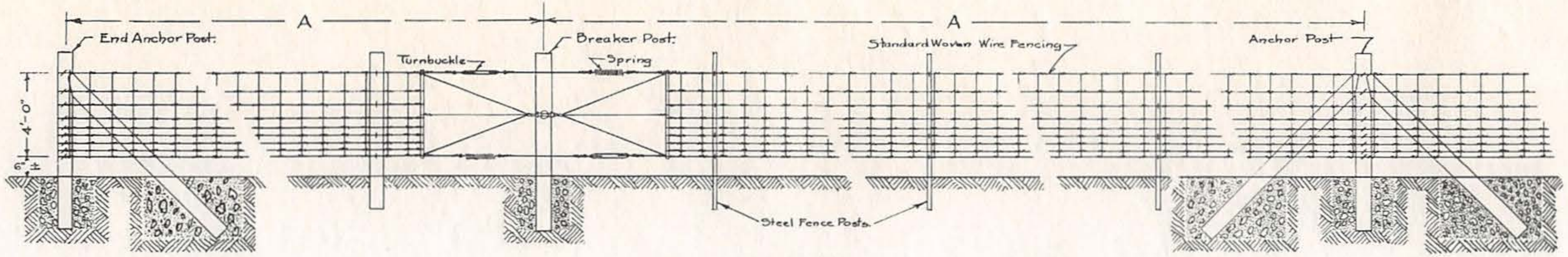
WHERE SIGN IS TO BE LOCATED OUTSIDE TRACK PLACE SIGN POST ON ENGINEMAN'S RIGHT 7'-2" FROM GAUGE OF RAIL.

OTHERWISE, SIGN TO BE LOCATED BETWEEN TRACKS.

SIGNS TO BE USED ONLY AT LOCATIONS SPECIFIED ON OFFICE OF CHIEF ENGINEER, COMMUNICATIONS AND SIGNALS DRAWINGS AND IN GENERAL ORDER CONCERNING THE PLACING OF CIRCUITS IN SERVICE.

BALTIMORE & OHIO RAILROAD
END OF TRACK CIRCUIT
& CUT SECTION SIGNS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 31, 1946

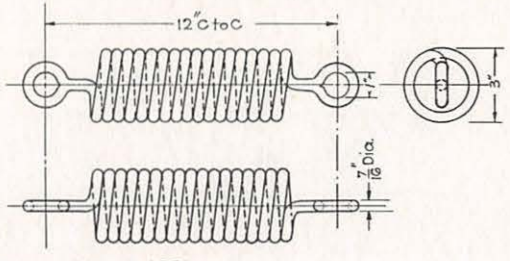
A25-1D


A
A
End Anchor Post.
Turnbuckle
Breaker Post.
Spring
Standard Woven Wire Fencing
Anchor Post
4'-0"
6" ±
Steel Fence Posts.

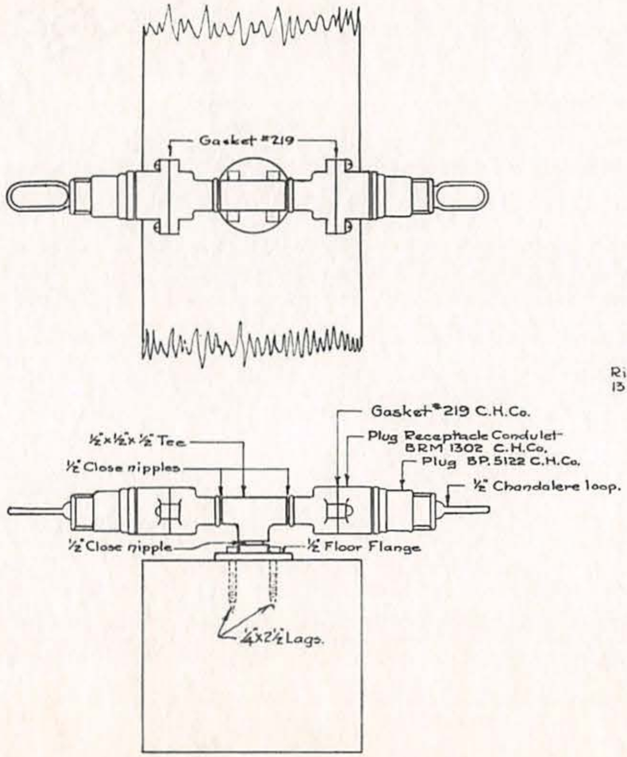
GENERAL ARRANGEMENT OF SAFETY FENCE
Scale - ¼ Inch = 1 Foot.

NOTES:—

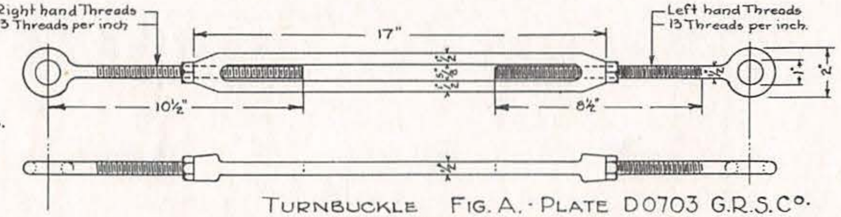
Distance "A" to depend on local conditions but not to exceed 225 feet.
Fencing to be Securely fastened on Anchor Posts and to be stapled or hooked loosely on Intermediate Posts.
Posts may be wood or steel as desired.
Anchor and Breaker Posts to be rigid. Set in concrete if necessary.


12" C to C
3"
7/16" Dia.

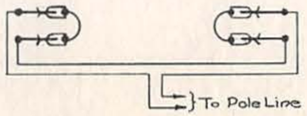
SPRING No. A 1001
Scale 3 Inches = 1 Foot.


Gasket #219
Gasket #219 C.H.Co.
½"x½"x½" Tee
Plug Receptacle Condulet BRM 1302 C.H.Co.
½" Close nipples
Plug BP. 5122 C.H.Co.
½" Chandalere loop.
½" Close nipple
½" Floor Flange
¼"x2½" Lags.

Detail of Breaker Post.


Right hand Threads
13 Threads per inch
Left hand Threads
13 Threads per inch.
17"
10½"
8½"
1"
2"

TURNBUCKLE FIG. A. - PLATE D0703 G.R.S.Co.
Scale - 3 Inches = 1 Foot.

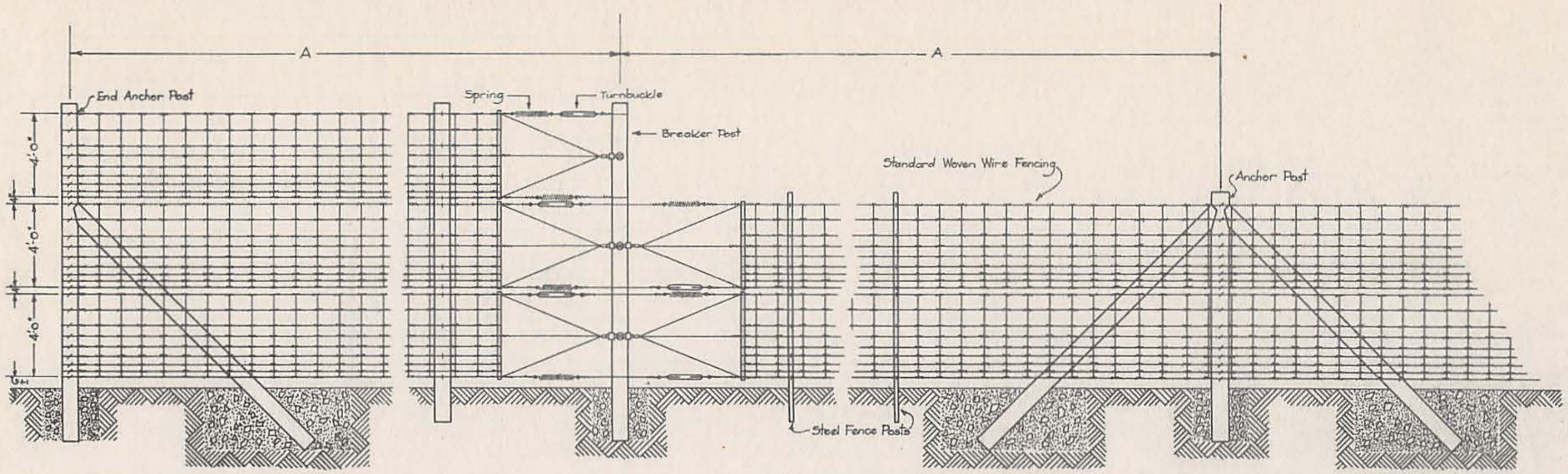

To Pole Line

TYPICAL CIRCUIT PLAN.

BALTIMORE & OHIO RAILROAD
SAFETY FENCE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 15, 1946

SHEET 1 OF 2 SHEETS

A-25-10-A



A
A
End Anchor Post
Spring
Turnbuckle
Breaker Post
Standard Woven Wire Fencing
Anchor Post
4'-0"
4'-0"
4'-0"
Steel Fence Posts

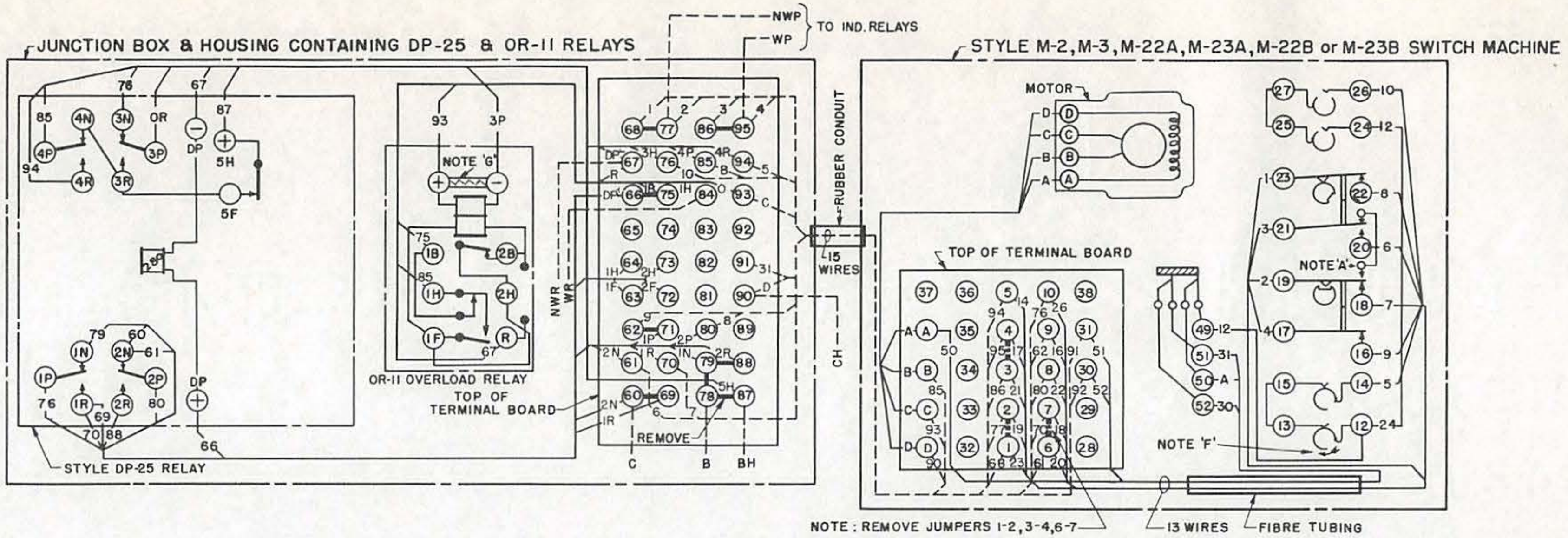
GENERAL ARRANGEMENT OF MULTIPLE
SAFETY FENCE
Scale: ¼ Inch = 1 Foot

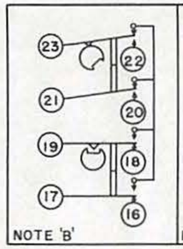
NOTES:-
Distance "A" to depend on local conditions but not to exceed 225 feet.
Fencing to be securely fastened on Anchor Posts and to be stapled or hooked loosely on Intermediate Posts.
Posts may be wood or steel as desired.
Anchor and Breaker Posts to be rigid. Set in concrete if necessary.

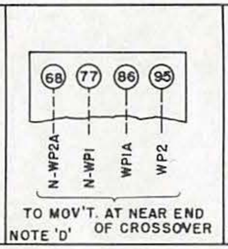
BALTIMORE & OHIO RAILROAD
SAFETY FENCE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 15, 1946

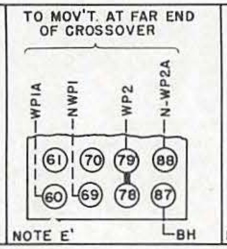
SHEET 2 OF 2 SHEETS

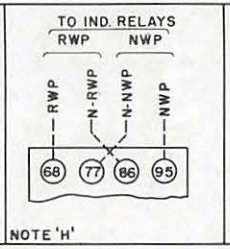
A-25-10-A

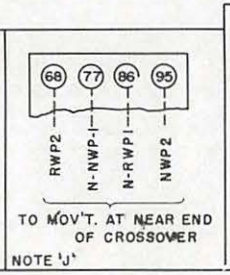

JUNCTION BOX & HOUSING CONTAINING DP-25 & OR-11 RELAYS
NWP
WP
TO IND. RELAYS
STYLE M-2, M-3, M-22A, M-23A, M-22B or M-23B SWITCH MACHINE
STYLE DP-25 RELAY
OR-11 OVERLOAD RELAY
NOTE 'G'
TOP OF TERMINAL BOARD
REMOVE
RUBBER CONDUIT
15 WIRES
NWR
WR
CH
C
B
BH
MOTOR
TOP OF TERMINAL BOARD
NOTE 'A'
NOTE 'F'
NOTE : REMOVE JUMPERS 1-2, 3-4, 6-7
13 WIRES
FIBRE TUBING

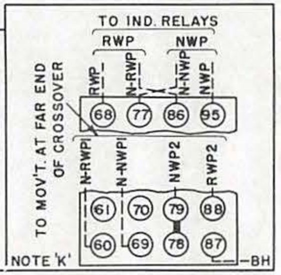

NOTE 'B'


N-WP2A
N-WP1
WP1A
WP2
TO MOV'T. AT NEAR END OF CROSSOVER
NOTE 'D'


TO MOV'T. AT FAR END OF CROSSOVER
WP1A
NWP1
WP2
N-WP2A
BH
NOTE E'


TO IND. RELAYS
RWP
NWP
RWP
N-RWP
N-NWP
NWP
NOTE 'H'


RWP2
N-NWP1
N-RWP1
NWP2
TO MOV'T. AT NEAR END OF CROSSOVER
NOTE 'J'


TO IND. RELAYS
RWP
NWP
RWP
N-RWP
N-NWP
NWP
TO MOV'T. AT FAR END OF CROSSOVER
N-RWP1
N-NWP1
NWP2
RWP2
BH
NOTE 'K'

GENERAL:-DOTTED LINES REPRESENT WIRES WHICH MUST BE CONNECTED IN THE FIELD. SOLID LINES REPRESENT WIRES CONNECTED AT THE FACTORY. WIRING SHOWN IS FOR EITHER A RIGHT-HAND OR **LEFT-HAND** SWITCH MACHINE WITH THE **RIGHT**-HAND SWITCH POINT NORMALLY CLOSED. INTERCHANGE THE EXTERNAL LEADS TO TERMINALS B & C AND TO TERMINALS 5 & 10 ON THE TERMINAL BOARD OF THE SWITCH MACHINE, AND REVERSE THE INDICATION CIRCUIT CONTROLLER CAMS. IF USED FOR EITHER A RIGHT-HAND OR LEFT-HAND SWITCH MACHINE WITH THE LEFT-HAND SWITCH POINT NORMALLY CLOSED.

EXPLANATION OF GENERAL NOMENCLATURE:- NUMBER IN CIRCLE REPRESENTS NUMBER OF TERMINAL. NUMBER NOT IN CIRCLE REPRESENTS NUMBER OF TERMINAL TO WHICH OTHER END OF WIRE IS CONNECTED.

(A) FOR SINGLE SWITCH AND NEAR END OF CROSSOVER WITH POLARIZED INDICATION CONTACT PIECE ADJUSTED AS SHOWN.
(B) FOR FAR END OF CROSSOVER WITH POLARIZED INDICATION, AND FOR SINGLE SWITCH AND BOTH ENDS OF CROSSOVER WITH NEUTRAL RELAY INDICATION CONTACT PIECE ADJUSTED TO TAKE CARE OF ALL FOUR INDICATION CONTACTS.
(C) TERMINAL BOARD CONNECTION FOR SINGLE SWITCH, WITH POLARIZED RELAY INDICATION.
(D) TERMINAL BOARD CONNECTION FOR RELAY & MOVEMENT AT FAR END OF CROSSOVER WITH POLARIZED RELAY INDICATION (OTHERWISE SAME AS SINGLE SWITCH.)
(E) TERMINAL BOARD CONNECTION FOR RELAY & MOVEMENT AT NEAR END OF CROSSOVER WITH POLARIZED RELAY INDICATION (OTHERWISE SAME AS SINGLE SWITCH.)
(F) ARROW INDICATED THE DIRECTION OF NEXT **ROTATION**.
(G) REMOVE THIS JUMPER IN ACCORDANCE WITH INSTRUCTION ON TAG ATTACHED TO OR-11 RELAY.
(H) TERMINAL BOARD CONNECTION FOR SINGLE SWITCH, WITH NEUTRAL RELAY INDICATION (OTHERWISE SAME AS FOR SINGLE SWITCH WITH POLARIZED RELAY INDICATION.)
(J) TERMINAL BOARD CONNECTION FOR RELAY & MOVEMENT AT FAR END OF CROSSOVER, WITH NEUTRAL RELAY INDICATION (OTHERWISE SAME AS SINGLE SWITCH.)
(K) TERMINAL BOARD CONNECTION FOR RELAY AND MOVEMENT AT NEAR END OF CROSSOVER, WITH NEUTRAL RELAY INDICATION (OTHERWISE SAME AS SINGLE SWITCH.)
(L) INTERCHANGE EXTERNAL LEADS TO B & C FOR MOVEMENTS WITH 192:1 GEAR REDUCTION.

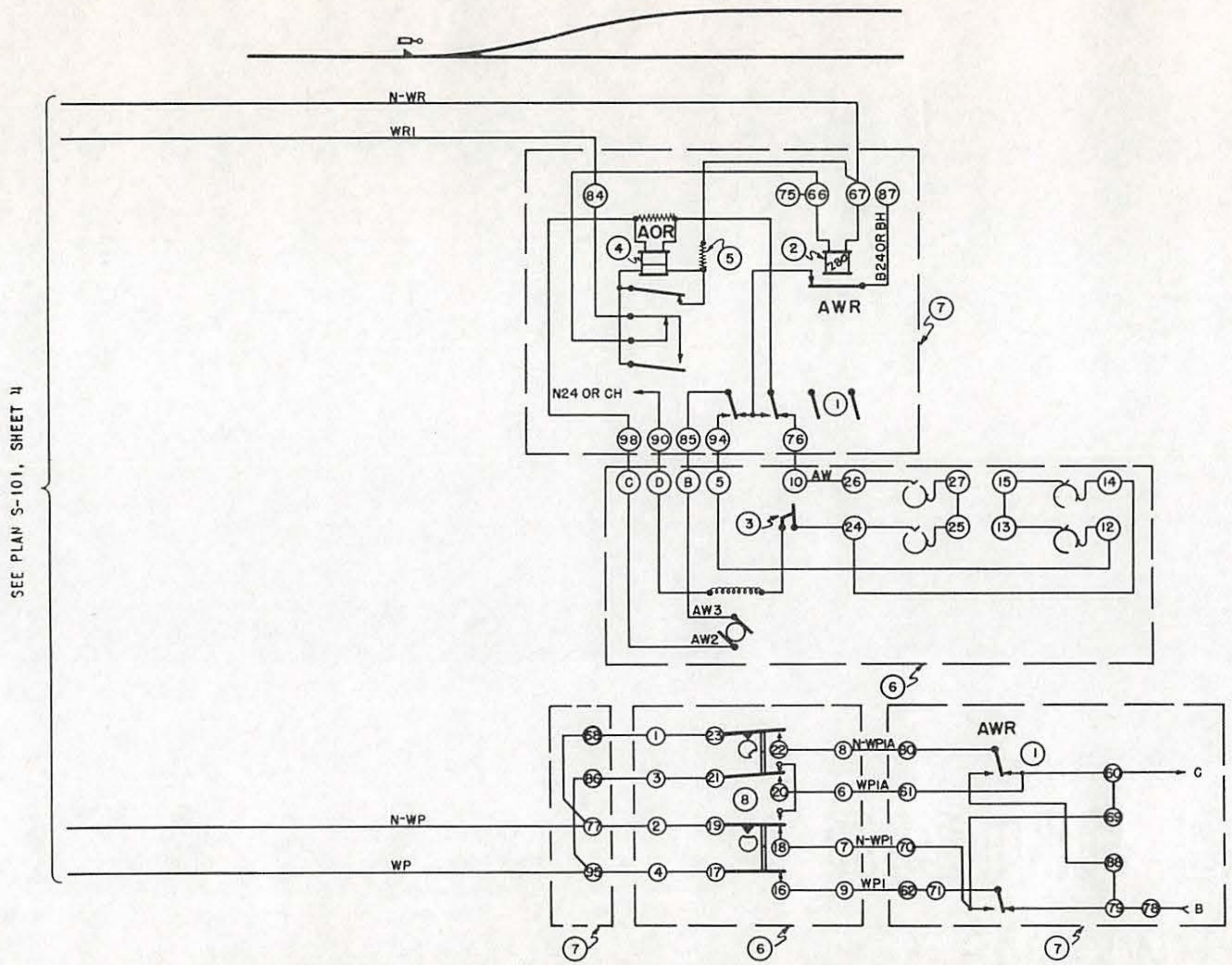
APPROVED: A.H.Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
CIRCUITS FOR STYLE 'M' SLM
USING DP-25 & OR-11 RELAYS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 6, 1946

3-28-52 : Style M3-M23A & M23B added.

C-100-A

SINGLE SWITCH


N-WR
WRI
SEE PLAN S-101, SHEET 4
84
AOR
4
5
75
66
67
87
2
AWR
B24 OR BH
7
N24 OR CH
1
98
90
85
94
76
C
D
B
5
10
AW
26
27
15
14
3
24
25
13
12
AW3
AW2
6
N-WP
WP
58
96
77
95
1
3
2
4
23
22
21
20
19
18
17
16
8
N-WPIA
WPIA
N-WPI
WPI
80
81
70
68
71
60
69
88
79
78
C
B

CONNECTIONS INDICATED THUS # TO BE MADE AS SHOWN. NO OTHER CIRCUIT TO BE CONNECTED TO "C" BETWEEN THE WR RELAY CONTACTS AND THE INDICATION CONTROLLER CONTACTS.

(1) CONTACTS FOR CONTROL OF WP RELAY.
(2) SWITCH CONTROL RELAY DP25 WITH IF (MHD)-OB NEUTRAL CONTACT AND 4N-4R POLAR CONTACTS, 280 OHM, PC.232127, DWG.C9270 SH.32.
(3) MOTOR CUTOUT STICK CONTACT ACTUATED BY HAND CRANK ON M2 MOVEMENT OR DUAL SELECTOR CONTACT OF M22 MOVEMENT.
(4) OR-11 OVERLOAD RELAY. CANNOT BE USED WITH 30 SECOND MOVEMENT.
(5) RESISTOR (INCLUDED WITH RELAY)
(6) SWITCH MACHINE.
(7) JUNCTION BOX & HOUSING CONTAINING DP-25 & OR-11 RELAY.
(8) CONTACTS ON INDICATION CIRCUIT CONTROLLER.

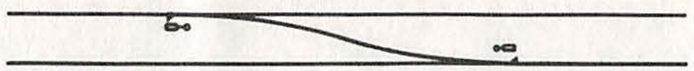
APPROVED: ASHunt
CHIEF ENG'R. COMM. & SIGS.

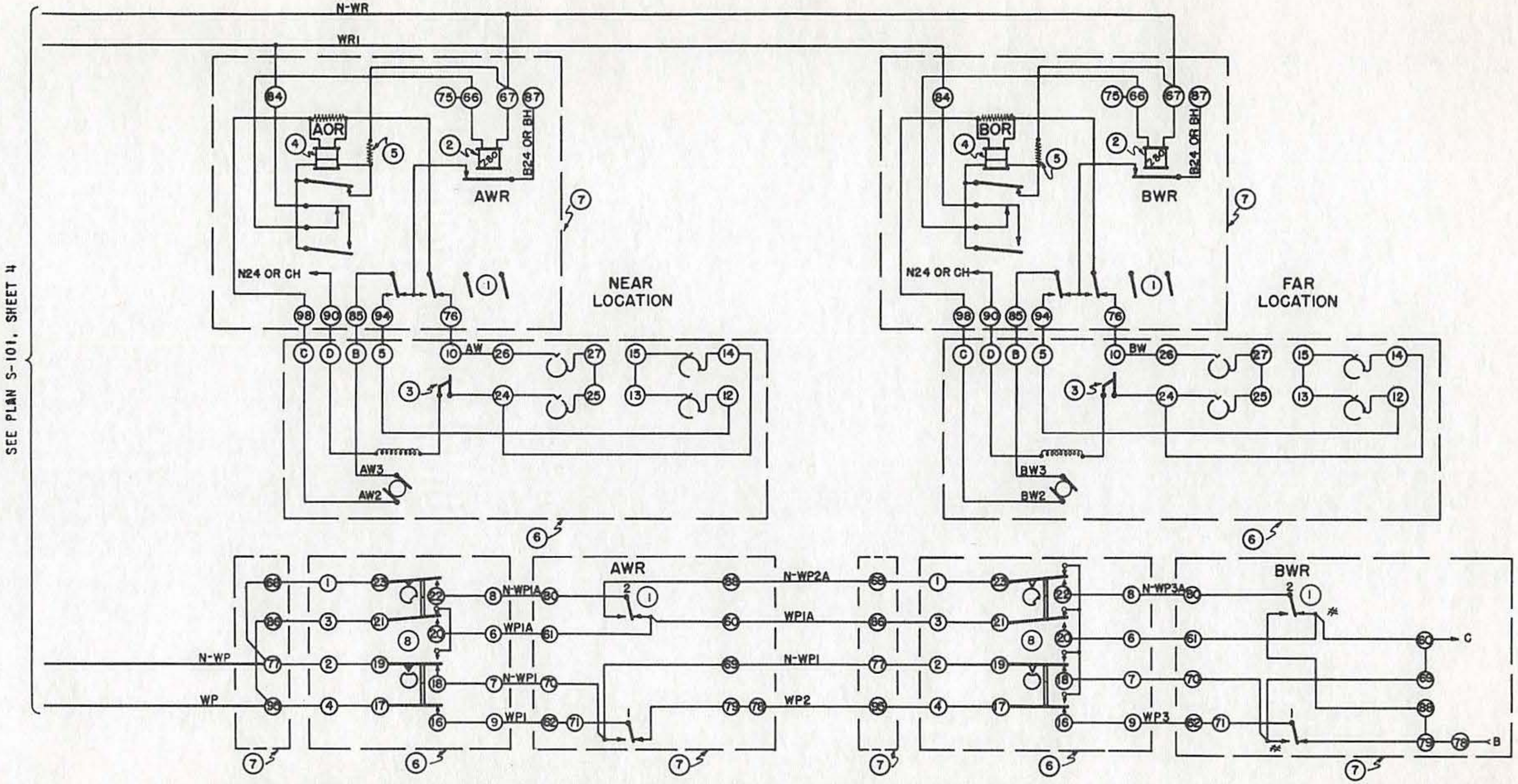
BALTIMORE & OHIO RAILROAD
CONTROL & INDICATION CIRCUITS
FOR STYLE "M" S.L.M. USING DP-25
& OR-11 RELAY
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 9, 1946

SHEET NO. 1

C-101-A

CROSSOVER




N-WR
WR1
AOR
AWR
BOR
BWR
B24 OR BH
N24 OR CH
NEAR LOCATION
FAR LOCATION
SEE PLAN S-101, SHEET 4
AW
BW
AW3
AW2
BW3
BW2
N-WP
WP
N-WP1A
WP1A
N-WP1
WP1
N-WP2A
WP2
N-WP3A
WP3
C
B
①
②
③
④
⑤
⑥
⑦
⑧

CONNECTIONS INDICATED THUS # TO BE MADE AS SHOWN. NO OTHER CIRCUIT TO BE CONNECTED TO "C" BETWEEN THE WR RELAY CONTACTS AND THE INDICATION CONTROLLER CONTACTS.

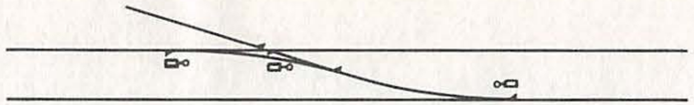
(1) CONTACTS FOR CONTROL OF WP RELAY.
(2) SWITCH CONTROL RELAY DP25 WITH IF (MHD)-OB NEUTRAL CONTACT AND 4N-4R POLAR CONTACTS, 280 OHM, PC. 232127, DWG. C9270 SH. 32.
(3) MOTOR CUTOUT STICK CONTACT ACTUATED BY HAND CRANK ON M2 MOVEMENT OR DUAL SELECTOR CONTACT OF M22 MOVEMENT.
(4) OR-11 OVERLOAD RELAY CANNOT BE USED WITH 30 SECOND MOVEMENT.
(5) RESISTOR (INCLUDED WITH RELAY.)
(6) SWITCH MACHINE.
(7) JUNCTION BOX & HOUSING CONTAINING DP-25 & OR-11 RELAY.
(8) CONTACTS ON INDICATION CIRCUIT CONTROLLER.

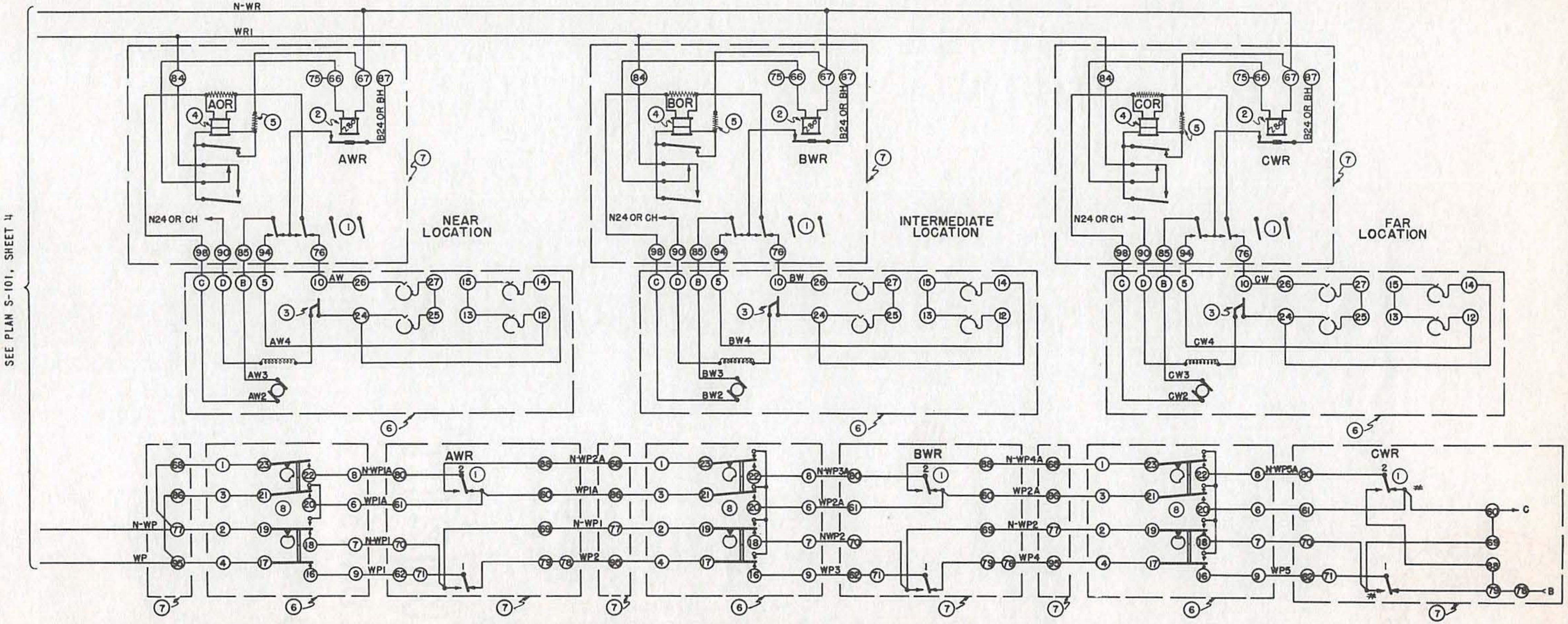
APPROVED: AJHunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
CONTROL & INDICATION CIRCUITS
FOR STYLE "M" S.L.M. USING DP-25
& OR-11 RELAYS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 9, 1946
SHEET NO. 2

C-101-A

CROSSOVER WITH M.P.F.




N-WR
WR1
SEE PLAN S-101, SHEET 4
AOR
AWR
BOR
BWR
COR
CWR
B24 OR BH
N24 OR CH
NEAR LOCATION
INTERMEDIATE LOCATION
FAR LOCATION
AW
BW
CW
AW4
AW3
AW2
BW4
BW3
BW2
CW4
CW3
CW2
N-WP
WP
N-WP1A
WP1A
N-WP1
WP1
N-WP2A
WP2A
N-WP2
WP2
N-WP3A
WP3
N-WP4A
WP4
N-WP5A
WP5
C
B
#

CONNECTIONS INDICATED THUS # TO BE MADE AS SHOWN. NO OTHER CIRCUIT TO BE CONNECTED TO "C" BETWEEN THE WR RELAY CONTACTS AND THE INDICATION CONTROLLER CONTACTS.

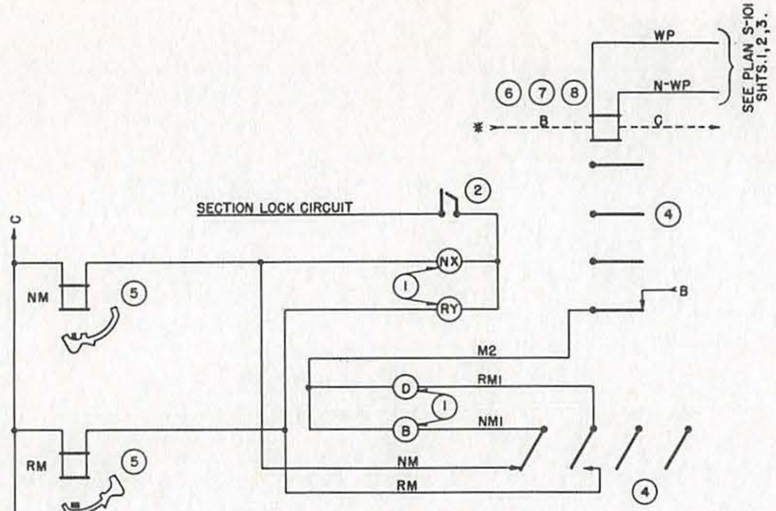
(1) **CONTACTS FOR CONTROL OF WP RELAY.**
(2) SWITCH CONTROL RELAY DP25 WITH 1F (MHD)-OB NEUTRAL CONTACT AND 4N-4R POLAR CONTACTS, 280 OHM, PC.232127, DWG.C9270 SH.32.
(3) MOTOR CUTOUT STICK CONTACT ACTUATED BY HAND CRANK ON M2 MOVEMENT OR DUAL SELECTOR CONTACT OF M22 MOVEMENT.
(4) OR-11 OVERLOAD RELAY CANNOT BE USED WITH 30 SECOND MOVEMENT.
(5) RESISTOR (INCLUDED WITH RELAY.)
(6) **SWITCH MACHINE.**
(7) JUNCTION BOX & HOUSING CONTAINING DP-25 & OR-11 RELAY
(8) **CONTACTS ON INDICATION CIRCUIT CONTROLLERS.**

APPROVED: AH Hunt
CHIEF ENG'R. COMM. & SIGS.

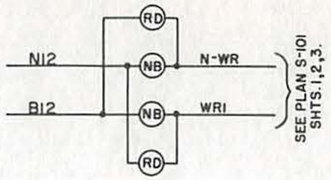
BALTIMORE & OHIO RAILROAD
CONTROL & INDICATION CIRCUITS
FOR STYLE "M" S.L.M. USING DP-25
& OR-11 RELAYS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 9, 1946
SHEET NO. 3

C-101-A

FIG. 1-SECTION LOCKING CIRCUIT WITHOUT
SEPARATE DETECTOR LOCK


WP
N-WP
SEE PLAN S-101
SHTS.1,2,3.
⑥⑦⑧
*
B
C
SECTION LOCK CIRCUIT
②
C
NX
①
RY
④
B
NM
⑤
M2
RM1
D
①
B
NM1
RM
⑤
NM
RM
④

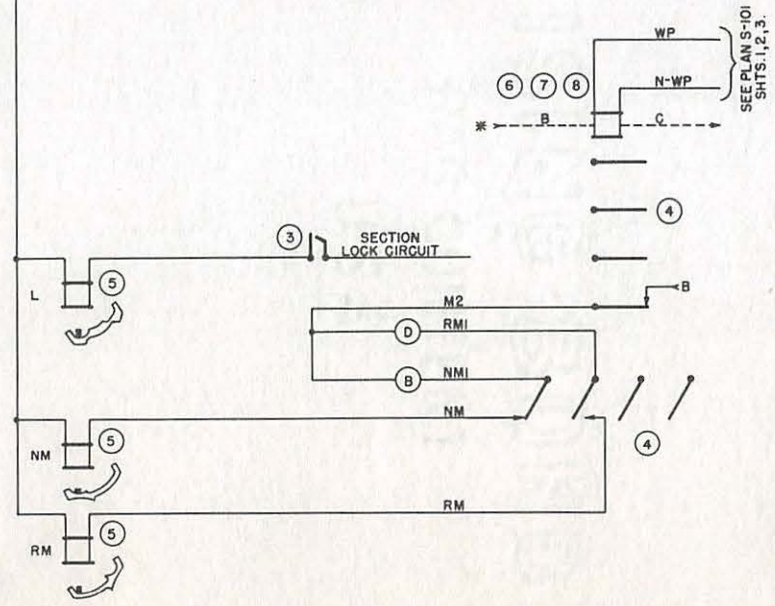
CONTROL LEVER OF MODEL 14, ELECTRO-MECHANICAL OR
TABLE INTERLOCKING MACHINE EQUIPPED WITH MECHANICAL
AND SECTION LOCKING.


RD
N12
NB
N-WR
B12
NB
WR1
RD
SEE PLAN S-101
SHTS.1,2,3.

(1) THESE CONTACTS TO BE PLACED ON ENLARGED SECTION WHEN USING OLD TYPE MACHINE HAVING 60° OR 90° ROLLER TRAVEL.
(2) LATCH CONTROLLER WITH CAM
(3) LATCH CONTROLLER WITHOUT CAM
(4) CONTACTS FOR CONTROL OF SIGNALS
(5) MAGNETS 90 OHM. (WHEN 10 VOLT STORAGE BATTERY IS USED.)
(6) MODEL 12 POLARIZED RELAY
(7) DP-14 POLARIZED RELAY
(8) DP-17 POLARIZED RELAY

CIRCUIT MARKED * TO BE USED WITH DP-17 POLARIZED RELAY ONLY.

FIG. 2-SECTION LOCKING CIRCUIT WITH
SEPARATE DETECTOR LOCK


WP
N-WP
SEE PLAN S-101
SHTS.1,2,3.
⑥⑦⑧
*
B
C
④
③
SECTION
LOCK CIRCUIT
B
L
⑤
M2
RM1
D
B
NM1
NM
④
NM
⑤
RM
RM
⑤

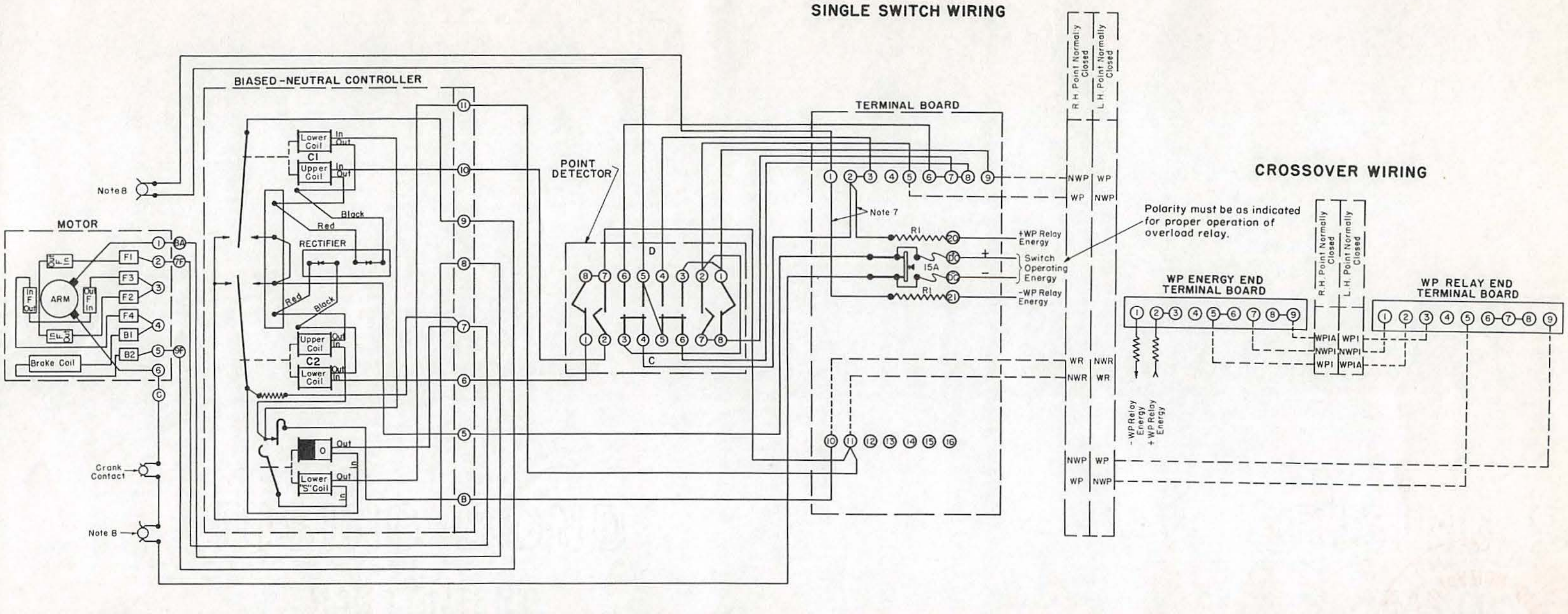
Lever for Model 14: tagging changed, C to N12 & B to B12.

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
CONTROL & INDICATION CIRCUITS
FOR STYLE "M" S.L.M. USING DP-25
& OR-11 RELAY
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 23, 1947

SHEET NO. 4

C-101-A


SINGLE SWITCH WIRING
CROSSOVER WIRING
BIASED-NEUTRAL CONTROLLER
MOTOR
ARM
Brake Coil
F1
F2
F3
F4
B1
B2
6A
7F
9F
Note 8
Crank Contact
Lower Coil
C1
Upper Coil
Upper Coil
C2
Lower Coil
Lower "S" Coil
In
Out
Red
Black
RECTIFIER
POINT DETECTOR
D
C
TERMINAL BOARD
Note 7
R1
+WP Relay Energy
Switch Operating Energy
-WP Relay Energy
15A
R.H. Point Normally Closed
L.H. Point Normally Closed
NWP
WP
WR
NWR
Polarity must be as indicated for proper operation of overload relay.
WP ENERGY END TERMINAL BOARD
WP RELAY END TERMINAL BOARD
WPIA
WPI
NWPI
-WP Relay Energy
+WP Relay Energy

Notes :

1- Connections are shown for single switch with R.H. Point normally closed as viewed from point detector end.
2- On machines to operate Block Type Derail transpose wire ⑥A and Ⓒ to motor terminal post 1 & 6.
3- When applying a machine to a Crossover be sure to arrange terminal board metal connectors as shown.
4- All wires to motor terminal block are tagged as shown.
5- Crank contact opens motor circuit when hand crank is inserted.
6- The "OUT" lead of all coils is the one nearest to tag.
7- R1 resistors and the two jumpers indicated are supplied only when required. Values of R1 resistors when used depends on voltage used for WP relay.
8- These contacts open when selector lever is placed in "HAND" position.

Approved: ASHunt
Chief Eng'r. Comm. & Sigs.

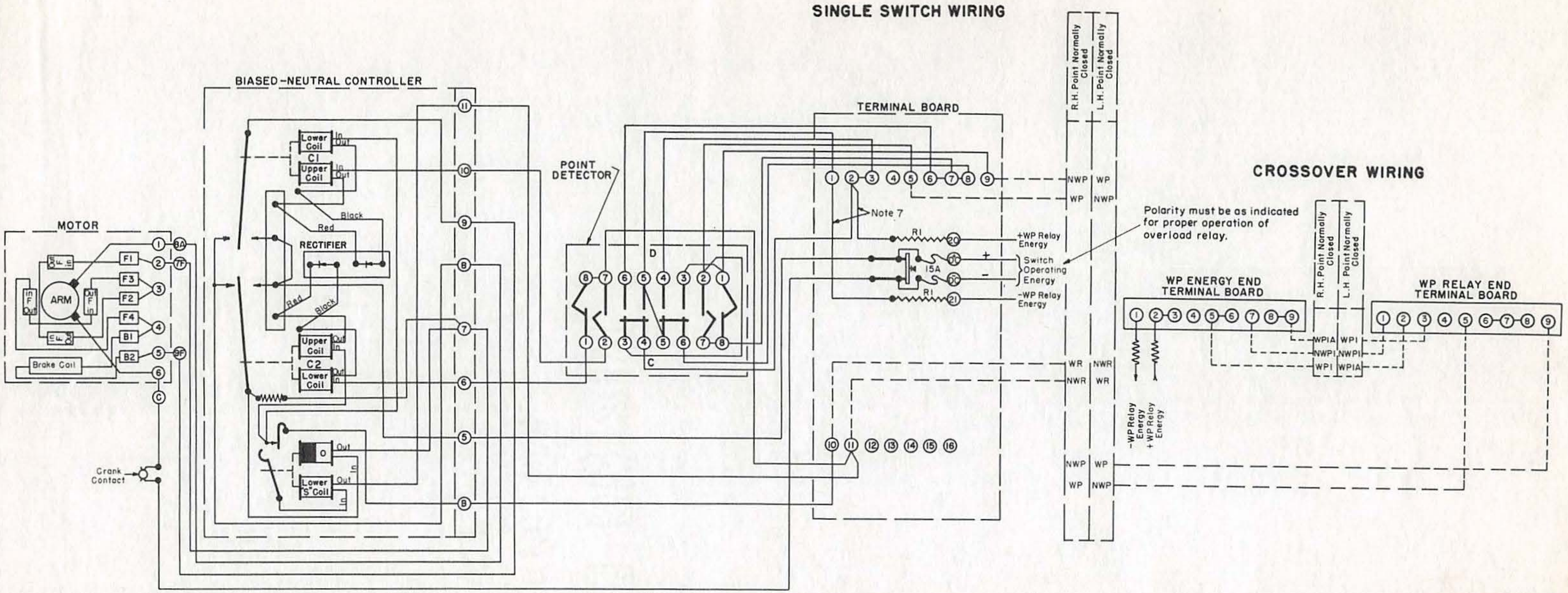
BALTIMORE & OHIO RAILROAD

WIRING FOR 5D SWITCH MACHINE WITH BIASED NEUTRAL CONTROLLER

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 26, 1949

C-104-A

Revised 3-13-51.


SINGLE SWITCH WIRING
CROSSOVER WIRING
BIASED-NEUTRAL CONTROLLER
MOTOR
ARM
F1
F2
F3
F4
B1
B2
Brake Coil
Crank Contact
8A
7F
8F
C
Lower Coil
Upper Coil
C1
C2
In
Out
Black
Red
RECTIFIER
O
Lower "S" Coil
POINT DETECTOR
D
C
TERMINAL BOARD
Note 7
R1
15A
+WP Relay Energy
Switch Operating Energy
-WP Relay Energy
R.H. Point Normally Closed
L.H. Point Normally Closed
NWP
WP
WR
NWR
Polarity must be as indicated for proper operation of overload relay.
WP ENERGY END TERMINAL BOARD
WP RELAY END TERMINAL BOARD
WPIA
WPI
NWPI
-WP Relay Energy
+WP Relay Energy

Notes:

1-Connections are shown for single switch with R.H. Point normally closed as viewed from point detector end.
2-On machines to operate Block Type Derail transpose wire (8A) and (C) to motor terminal post 1 & 6
3-When applying a machine to a Crossover be sure to arrange terminal board metal connectors as shown.
4-All wires to motor terminal block are tagged as shown.
5-Crank contact opens motor circuit when hand crank is inserted.
6-The "OUT" lead of all coils is the one nearest to tag.
7-R1 resistors and the two jumpers indicated are supplied only when required. Values of R1 resistors when used depends on voltage used for WP relay.

Approved: AHHewit
Chief Eng'r. Comm. & Sigs.

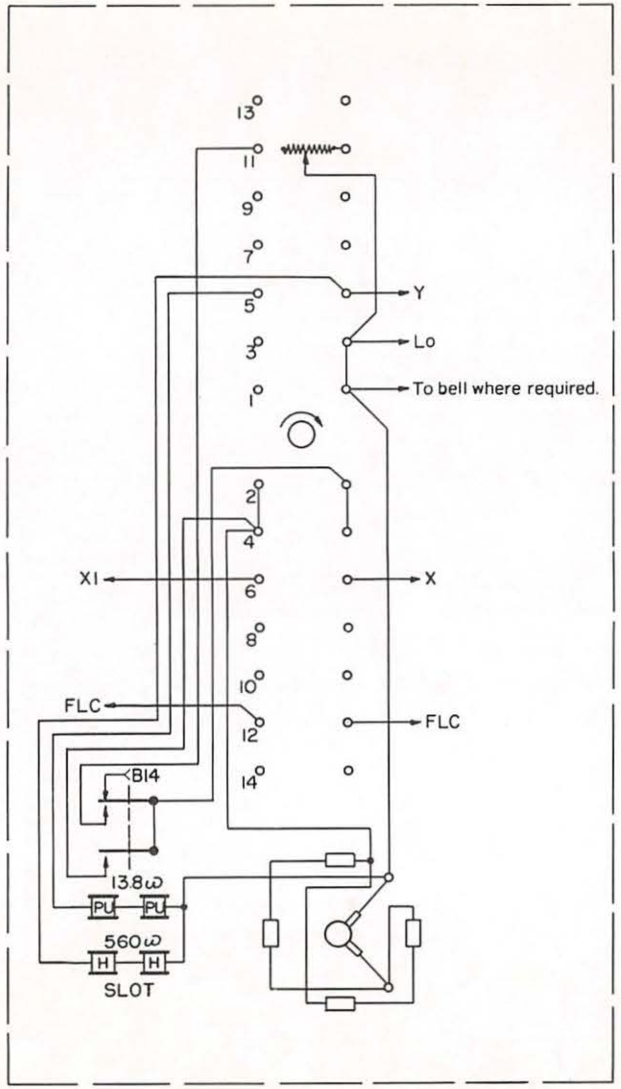
BALTIMORE & OHIO RAILROAD

WIRING FOR 5C SWITCH MACHINE WITH BIASED NEUTRAL CONTROLLER

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Oct. 4, 1949

Revised 3-13-51

C-105-A



CIRCUIT BREAKER FUNCTION	
Space Number	Use of Contact
1	Binding Post.
2	Motor Cutout.
3	Binding Post.
4	Motor Cutout.
5	Control for Slot pick-up coils.
6	To cut off bell when gate has dropped to horizontal position.
7	Spare
8	Spare
9	Spare
10	Spare
11	Control for Snub resistor
12	To extinguish lights only after gates have cleared.
13	Spare
14	Spare

NOTE:

When mechanism No. 3562-21GL-90 is repaired at Cumberland wiring shall be revised to conform with this drawing.

CONTACT OPERATION	
Space Number	Contact Made
1	
2	0°-88°
3	
4	0°-88°
5	0°-75°
6	3°-91°
7	
8	0°-85°
9	
10	0°-85°
11	3°-91°
12	85°-91°
13	87°-90°
14	0°-3°

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

WIRING DIAGRAM FOR W.R.R.S.CO. MODEL 10 GRAVITY TYPE SHORT ARM GATE MECHANISM NO.3562-21GL-90

Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

10-29-51: New Plan Made.
11-18-52: Adopted.
3-13-59: Revised.

C-115-A

AUTOMATIC TRAIN STOP

A25-5A	DUMMY INDUCTOR
S-109	INDUCTOR LAYOUT WITH MATERIAL LIST
A25-2A	TRACK INDUCTOR GAUGE

BATTERY BOXES

S-366	CONCRETE BATTERY BOX (ASSEMBLIES)
S-367	" " " (DETAILS)
S-368	" " " "
S-369	" " " "

DRAGGING EQUIPMENT DETECTOR

S-134	DRAGGING EQUIPMENT DETECTOR LAYOUT WITH MATERIAL LIST

ELECTRIC LAMPS

S-113	ELECTRIC LAMPS USED BY SIGNAL DEPARTMENT
S-110	" LIGHTED SWITCH LAMP WITH MATERIAL LIST

FOUNDATIONS

S-356	CONCRETE FOUNDATION FOR COMPENSATOR
S-311	" " " GROUND MAST SIGNAL
S-355	" " " HORIZONTAL CRANK STAND
S-312	" " " PIPE BRACKET POST

INSTRUCTIONS

BATTERIES

I-113	INSTRUCTIONS FOR CAUSTIC SODA BATTERIES COPPER OXIDE TYPE
I-112	" " LEAD TYPE STORAGE BATTERY SEALED GLASS JAR FLOATING CHARGE
I-111	" " NICKEL-IRON ALKALINE STORAGE BATTERY

BONDS

I-122	INSTRUCTIONS FOR INSTALLING CADWELL SIGNAL BONDS

INSPECTIONS & FIELD TESTS

I-123	GENERAL INSTRUCTIONS FOR SIGNAL INSPECTORS
I-120	SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS & INSPECTIONS

RELAYS

I-105	DIRECT CURRENT RELAY REQUIREMENTS

TRACK CIRCUITS

I-101	INSTRUCTIONS FOR MAINTENANCE AND ADJUSTMENT OF CONVENTIONAL NON-CODED D.C. TRACK CIRCUIT

WIRES AND CABLES

I-100	INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
I-125	" " SUSPENSION STRAND AND AERIAL CABLE

INTERLOCKING

25-3A	REMINDER TUBES FOR MACHINE LEVERS

MASTS - LADDERS - PLATFORMS - FITTINGS

COLOR POSITION LIGHT SIGNAL

25-6	C.P.L. SIGNAL ASSEMBLIES
25-6-B	HANDRAIL AND PLATFORM FOR C.P.L. SIGNALS
25-6-A	LADDERS AND STAYS FOR C.P.L. SIGNALS
S-343	"U" BOLT & CLAMP

NUMBER BOARDS - FITTINGS

25-86-C	NUMERALS AND LETTERS FOR SIGNAL NUMBERING
25-86-D	" " " " " "
25-86-E	" " " " " "

PIPE LINE FITTINGS

MECHANICAL

S-326	ANCHOR POST
S-300	CRANK AND JAW PINS
S-304	JAWS-TANG END AND ADJUSTABLE LINK
S-331	LOW ROCKING SHAFT BEARINGS
S-334	MULTIPLE VERTICAL CRANK STAND (DETAILS)
S-301	ONE INCH SIGNAL PIPE AND COUPLINGS
S-338	ONE-WAY PIPE CARRIERS
S-308	PIPE ADJUSTING SCREWS
S-344	PIPE CARRIER - ASSEMBLY
S-345	PIPE CARRIER - DETAILS
S-351	PIPE LINE INSULATION
S-328	ROCKING SHAFT ARMS
S-329	" " BEARINGS
S-330	" " ASSEMBLY AND DETAILS
S-302	SCREW AND SOLID JAWS
S-333	SINGLE VERTICAL CRANK STAND - DETAILS AND ASSEMBLY

PIPE LINE - FITTINGS (CONT'D)

MECHANICAL

S-303	SOLID JAWS WITH TANG ENDS
S-360	STUFFING BOX - FOR ONE INCH PIPE
S-309	TANG END - LUG AND COMP. LINK
S-336	TRANSVERSE PIPE CARRIERS - ASSEMBLY
S-337	" " " - DETAILS

POLE LINE

S-511	ARRANGEMENT OF TACKLE FOR PULLING SUSPENSION STRAND
S-500	CARRAGE BOLT - 3/8 INCH
S-501	CROSS ARM BOLT
S-517	" " STEEL PIN - 1/2 INCH
S-502	DOUBLE ARMING BOLT
S-518	FETTER DRIVE SCREW - 3/8 INCH
S-503	FLAT CROSS BRACES
S-511	GRADE CLAMP - TYPICAL INSTALLATION
S-514	GUY CLAMP - TWO BOLT
S-504	" " - THREE BOLT
S-515	GUY HOOK
S-508	INSULATING CLAMP FOR ATTACHING SUSPENSION STRAND TO BRIDGES
S-505	MESSENGER CLAMP - ONE BOLT
S-506	" " - THREE BOLT
S-512	REINFORCING LINKS AT INSIDE CORNERS - USE OF
S-512	SUSPENSION CLAMPS AT OUTSIDE CORNERS - USE OF 1/2 INCH
S-508	" STRAND ON BRIDGES - WOOD BLOCK SUPPORT FOR
S-509	" " AT "H" FIXTURE TERMINALS-METHOD OF TERMINATING
S-513	" " TO "H" FIXTURES - METHOD OF ATTACHING
S-509	" " ON POLES - METHOD OF DEAD-ENDING
S-507	" " TO " - " " ATTACHING 1/4" & 3/8"

POLE LINE (CONT'D)

S-507	SUSPENSION STRAND TO POLES - METHOD OF ATTACHING 1/2"
S-510	" " FOR SPANS OF OVER NORMAL LENGTH-REINFORCING
S-510	SUSPENSION STRAND - METHOD OF SPLICING
S-513	WALL BRACKETS FOR SUPPORTING SUSPENSION STRAND ON WALLS-USE OF
S-516	MESSENGER REINFORCING LINK
S-131	METHOD OF TERMINATING LINE WIRE
S-132	POLE LINE FITTINGS

RAIL BONDS - CONNECTORS - BOOTLEGS

S-138	BONDS FOR RAIL JOINTS
S-112	INSULATED JOINT LOCATIONS
S-111	TRENCH CABLE BOOTLEG

RELAY CASES - ACCESSORIES

S-114	TYPICAL ARRANGEMENT OF APPARATUS IN 9 WAY RELAY CASE G.R.S. NO. 56101-131-GR.1
S-115	TYPICAL ARRANGEMENT OF APPARATUS IN 12 WAY RELAY CASE G.R.S. NO. 56101-94-GR.1
S-116	TYPICAL ARRANGEMENT OF APPARATUS IN 24 WAY RELAY CASE G.R.S. NO. 56101-95-GR.1

S-126	TERMINAL ARRANGEMENT FOR STEEL RELAY CASES
S-129	TERMINAL BOARD FITTINGS FOR STEEL RELAY CASES

SAFETY FENCE

A25-10A	SAFETY FENCE

SIGNALS

ELECTRIC SEMAPHORE

S-332	TORQUE CURVES FOR ELECTRIC SEMAPHORE SPECTACLES

MECHANICAL SEMAPHORE

S-327	CLAMP FOR BASE OF GROUND MAST SIGNALS
S-357	DETAILS AND ASSEMBLY OF MECHANICAL SEMAPHORE BEARINGS
S-350	DIAGRAM OF SPECTACLE CLEARANCE
S-347	FILLER BLOCK - DETAILS AND ASSEMBLY
S-348	" " " " "
S-349	" " " " "
S-310	GUIDE CLAMPS FOR VERTICAL CONNECTIONS ON SIGNALS
S-318	" SUPPORTS AND CAPS FOR VERTICAL CONNECTIONS ON SIGNALS
S-319	" FOR VERTICAL CONNECTIONS ON SIGNAL
S-354	OIL FOUNT
S-353	SEMAPHORE LAMP - ONE LENS
S-305	SEMAPHORE SPECTACLE
S-358	OPERATING CONNECTION FOR MECHANICAL SIGNALS

HIGHWAY CROSSING

25-24-C	HIGHWAY CROSSING SIGNAL DETAILS
S-362	SHORT PINNACLE
S-363	SOCKET BASE FOR 5 INCH MAST

MECHANICAL TRAIN ORDER

S-359	TWO LEVER WALL MACHINE
S-361	TWO WAY-SINGLE LAMP SIGNAL

SIGNALS - (CONT'D)

TYPICAL LOCATIONS

S-142	SIGNAL LOCATIONS FOR SINGLE TRACK (SINGLE & TWIN LOCATIONS)
S-144	" " AT END OF PASSING SIDING - SINGLE TRACK
S-149	" " " " " " "
S-150	CUT SECTION LOCATIONS FOR SINGLE OR MULTIPLE TRACK
S-151	SIGNAL LOCATIONS FOR DOUBLE TRACK

SWITCH LAYOUTS - PARTS

S-136	MECHANICAL SWITCH LAYOUT USING SWIVEL TYPE FRONT ROD AND MATERIAL LIST
S-147	LAYOUT FOR 5A-B-C-D SWITCH MACHINES AND MATERIAL LIST
S-160	" " STYLE "A5" E.P.S.& L. MOVEMENT AND MATERIAL LIST
S-364	SWITCH CIRCUIT CONTROLLER LUGS
S-365	" " " RODS
S-153	" FITTINGS
S-152	SPECIAL SWITCH TIES
S-163	SWIVEL TYPE FRONT ROD - DETAILS AND ASSEMBLY
S-161	LAYOUT FOR STYLE "M2" "M22 A&B" SWITCH MACHINES & MATERIAL LIST

TYPICAL SWITCH CIRCUITS

C-100	CIRCUITS FOR STYLE "M" S.L.M. USING DP-25 & OR-11 RELAYS
C-101	CONTROL AND INDICATION CIRCUITS FOR STYLE "M" S.L.M. USING DP-25 & OR-11 RELAY

SIGNS

A25-1D	END OF TRACK CIRCUIT AND CUT SECTION SIGNS
A25-1B	MARKER FOR TUNNEL SIGNAL
A25-1A	PERMISSIVE MARKER AND METHOD OF APPLICATION
A25-1C	" " " " " "

WIRING ACCESSORIES

S-306	MULTIPLE UNIT TERMINAL BLOCKS
S-307	TERMINAL BLOCKS
S-339	TERMINAL CONNECTORS
S-137	WIRING ACCESSORIES

c. Insulation should not come in contact with creosoted lumber.

d. Conduit must be so maintained as to prevent the entrance of rodents. Conduit must not be located where heat is excessive or other conditions tend to destroy insulation.

e. Before installing wire or cable in a duct, a mandrel of proper cross section should be drawn through the duct to insure clearance and free interior of duct from obstruction.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 21, 1949

RECEIVED
FEB 14 1950
SPECIFICATION DEPT

4-25-50- New Drawing made-
Letter P.A. to Kerite Co.dated 4-20-50-

Item	Description	Principal Uses
	SINGLE CONDUCTOR INSULATED SIGNAL WIRES	
W-1	Single conductor #16 AWG (26 strand) S.D. copper wire, 2/64" insulation, B&O Spec. W-1.	Plug-in Relay Racks
W-2	Single conductor #16 AWG (19 strand) S.D. copper wire, 3/64" insulation, B&O Spec. W-2-8, or W-2-8a,or W-2-8b.	Office and Case Wiring
W-3	Single conductor #14 AWG (19 strand) S.D. copper wire, 3/64" insulation, B&O Spec. W-2-8, or W-2-8a,or W-2-8b.	DO
W-4	Single conductor #9 AWG (19 strand) S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a,or W-2-8b.	DO
W-5	Single conductor #6 AWG (19 strand) S.D. copper wire, 6/64" insulation, B&O Spec. W-2-8, or W-2-8a,or W-2-8b.	DO
W-6	Single conductor #14 AWG Solid S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a, or W-2-8b.	Line Drops, etc.
W-7	Single conductor # 9 AWG Solid S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a, or W-2-8b.	DO
W-8	Single conductor # 6 AWG Solid S.D. copper wire, 6/64" insulation, B&O Spec. W-2-8, or W-2-8a, or W-2-8b.	DO
	WEATHERPROOF LINE WIRES	
L-1	#6 AWG W.P. H.D. copper line wire, B&O Spec. L-1-5 or L-1-5a.	Power Lines
L-2	#4 AWG W.P. H.D. copper line wire, B&O Spec. L-1-5 or L-1-5a.	Power Lines for Increased conductivity
L-3	#10 AWG W.P. copper covered steel line wire, 30% conductivity, B&O Spec. L-1-5 or L-1-5a.	Line Relay Circuits
L-4	#8 AWG W.P. copper covered steel line wire, 30% conductivity, B&O Spec. L-1-5 or L-1-5a.	CTC Code Line
L-5	#6 AWG W.P. copper covered steel line wire, 30% conductivity, B&O Spec. L-1-5 or L-1-5a.	CTC Code Line for Increased Conductivity
	TIE WIRES	
T-1	#10 AWG W.P. annealed copper tie wires, 20" long, B&O Spec. L-1-5 or L-1-5a.	For #10 or #8 AWG W.P. Line Wires-
T-2	#6 AWG W.P. annealed copper tie wires, 24" long, B&O Spec. L-1-5 or L-1-5a.	For #6 or #4 AWG W.P. Line Wires-

NOTES: (1) In cases where exact wire or cable desired is not listed and nearest standard size will not serve, special wire or cable may be obtained provided requisition fully explains the need.

(2) Order by item number and description as above. (Omit usage except where special).

(3) No item of wire or cable shall call for less than 1000 feet on purchase order without special authority.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 28,1950

Sheet No. 1

I-100-D

Item	Description	Principal Uses
	SINGLE CONDUCTOR UNDERGROUND SIGNAL CABLES	
C-1	Single conductor U.G.cable #9 AWG solid S.D.copper conductor 5/64" Kerite insulation, bronze tape.	Instr.Case to Track Circuit Bootleg
C-2	Single conductor U.G.cable #9 AWG (19 strand) S.D.copper conductor 5/64" Kerite insulation, bronze tape.	Instr.Case to ATS inductor
C-3	Single conductor U.G.cable #6 AWG solid S.D.copper conductor 6/64" Kerite insulation, bronze tape.	Instr.Case to Track Circuit Bootleg
	MULTIPLE CONDUCTOR UNDERGROUND SIGNAL CABLES	
C-4	4 conductor U.G.cable #9 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	Miscellaneous U.G.Circuits
C-5	5 conductor U.G.cable #9 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	Signals,Switch Machines,etc
C-6	7 conductor U.G.cable #9 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	DO
C-7	9 conductor U.G.cable #9 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	DO
C-8	4 conductor U.G.cable #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	Miscl.U.G.Relay Circuits
C-9	5 conductor U.G.cable #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	DO
C-10	7 conductor U.G.cable #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	DO
C-11	12 conductor U.G.cable 3 #9, 9 #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	Main Runs, U.G.
C-12	19 conductor U.G.cable 3 #9, 16 #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	DO
C-13	7 conductor U.G.cable #12 AWG solid S.D.copper conductors, 5/64" Kerite insulation, bronze tape.	Miscellaneous U.G.Circuits
	MULTIPLE CONDUCTOR AERIAL SIGNAL CABLES	
C-14	12 conductor, aerial cable 1 #9, 11 #14 AWG solid S.D. copper conductors 5/64" Kerite insulation, asbestos braid.	Main Runs
C-15	19 conductor, aerial cable 1 #9, 18 #14 AWG solid S.D. copper conductors 5/64" Kerite insulation, asbestos braid.	Main Runs
C-16	27 conductor, aerial cable 2 #9, 25 #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, asbestos braid.	Main Runs
C-17	37 conductor, aerial cable 4 #9, 33 #14 AWG solid S.D.copper conductors, 5/64" Kerite insulation, asbestos braid.	Main Runs

4-25-50 - New Drawing Made - Letter P.A. to Kerite Co.dated 4-20-50

NOTES: (4) Bronze tape U.G. cables to have cloth tape, 1 jute, 1 bronze tape, 1 jute, 1 asbestos serving and talc. All jute and asbestos servings to be impregnated.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR SIGNAL WIRES AND CABLES

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 28,1950

Sheet No.2

I-100-D

1- Handling.

a. Care must be exercised in the shipping, handling, laying or pulling in, splicing and housing of wire and cable.

b. Wire or cable on reels should be shipped with all lagging properly in place. Care must be taken in attaching lagging to the reels so as not to puncture the insulation. Nails must not be used in securing tags to reels.

c. Wire or cable in coils should be shipped properly bound and wrapped with a protective covering of burlap or other suitable wrapping material. Tags giving a description of contents should be firmly attached to the coils, both inside and outside the wrapping.

d. Wire or cable not meeting the specification for the class of service intended must not be installed.

e. Wire or cable showing any evidence of injury must not be used without proper authority.

f. Wire or cable should be stored under cover where it will not become mildewed or liable to be damaged by other materials and must be kept away from excessive heat.

g. Wire or cable must not be removed from reels or coils until ready to install. All nails must be removed from the edges of reels.

h. Reels must be set up so they will revolve easily and the wire or cable will pay off from the top. When wire is used from a coil, a "Pay out reel" shall be used. Unless equipped with automatic brake the reel shall be attended to prevent excessive slack from running out.

i. Precaution must be taken to prevent the kinking or twisting of wire. Should any kink or twist unavoidably occur, do not attempt to pull or "throw out" the kink or twist, but carefully remove it by hand.

j. Insulation must not be injured or bruised by dropping, stepping, throwing tools or material on wire.

k. Insulation must be kept free from oils, grease, acids and alkalies.

l. Wire or cable must not be pulled over rough surfaces or through cinders.

m. Separate wires or cables that are to go into one duct should be pulled in at one time. For small gage single-conductor wires, it is preferable to hitch to the copper conductors and so arrange the hitch that the pulling strain will equalize on all the wires involved in such a pull. The "basket-weave" hitch which grips the outside of a cable, should be used when pulling in a multiple conductor cable.

n. Braided cables or a number of single-conductor wires should be pulled in by hand in order to avoid straining conductors in the event they become "caught" in the conduit.

2- Conduits.

a. Conduits must be free of any foreign substances before installing wire or cable.

b. Wire and cable must be laid in conduit loosely without stretching or crowding and should not be doubled back in conduit. Slack should be taken care of in junction boxes and other housings.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 21, 1949

c. Insulation should not come in contact with creosoted lumber.

d. Conduit must be so maintained as to prevent the entrance of rodents. Conduit must not be located where heat is excessive or other conditions tend to destroy insulation.

e. Before installing wire or cable in a duct, a mandrel of proper cross section should be drawn through the duct to insure clearance and free interior of duct from obstruction.

Approved: ____________________
Chief Engineer Comm. & Signals

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SIGNAL WIRES AND CABLES
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Item	Description	Principal Uses
	SINGLE CONDUCTOR INSULATED SIGNAL WIRES	
W-1	Single conductor #16 AWG (26 strand) S.D. copper wire, 2/64" insulation, B&O Spec. W-1.	Plug-in Relay Racks
W-1a	Single conductor #14 AWG (26 strand) S.D. copper wire, 3/64" insulation, B&O Spec. W-2-8a or TC Green w/o braid	Plug-in Relay Racks
W-2	Single conductor #16 AWG (19 strand) S.D. copper wire, 3/64" insulation, B&O Spec. W-2-8, or W-2-8a, or W-2-8b.	Office and Case wiring
W-3	Single conductor #14 AWG (19 strand) S.D. copper wire, 3/64" insulation, B&O Spec. W-2-8, or W-2-8a, or W-2-8b.	DO
W-4	Single conductor # 9 AWG (19 strand) S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a.	Line Drops, etc.
W-5	Single conductor # 6 AWG (19 strand) S.D. copper wire, 6/64" insulation, B&O Spec. W-2-8, or W-2-8a.	DO
W-6	Single conductor #14 AWG Solid S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a.	DO
W-7	Single conductor # 9 AWG Solid S.D. copper wire, 5/64" insulation, B&O Spec. W-2-8, or W-2-8a.	DO
W-8	Single conductor # 6 AWG Solid S.D. copper wire, 6/64" insulation, B&O Spec. W-2-8, or W-2-8a.	DO
	WEATHERPROOF LINE WIRES	
L-1	#6 AWG W.P. H.D. copper line wire, B&O Spec, L-1-5, L-1-5a, or L-1-5b.	Power Lines
L-2	#4 AWG W.P. H.D. copper line wire, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	Power Lines for increased conductivity
L-3	#10 AWG W.P. copper covered steel line wire, 30% conductivity, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	Line Relay Circuits
L-4	# 8 AWG W.P. copper covered steel line wire, 40% conductivity, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	CTC Code Line
L-5	# 6 AWG W.P. copper covered steel line wire, 40% conductivity, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	CTC Code Line for Increased Conductivity
	TIE WIRES	
T-1	#10 AWG W.P. annealed copper tie wires, 20" long, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	For #10 or #8 AWG W.P. Line Wires-
T-2	# 6 AWG W.P. annealed copper tie wires, 24" long, B&O Spec. L-1-5, L-1-5a, or L-1-5b.	For #6 or #4 AWG W.P. Line Wires-

NOTES:
(1) In cases where exact wire or cable desired is not listed and nearest standard size will not serve, special wire or cable may be obtained provided requisition fully explains the need.
(2) Order by item number and description as above. (Omit usage except where special).
(3) No item of wire or cable shall call for less than 1000 feet on purchase order without special authority.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR SIGNAL WIRES AND CABLES

Office of Signal Engineer
Baltimore, Md.
April 28, 1950
Rev. June 5, 1958

Sheet No. 1

I-100-G

4-25-50: New shee[illegible]ade - Letter P.A. to Kerite Co. 4-20-50.
7-12-52: Item W1a added.
6-12-56: W-2-8b removed from Items W-4, 5, 6, 7 & 8
2-28-57: Spec. L-1-5b added.
6-5-58 - Items L1 & L2 rev.

1- Track circuits must be adjusted as specified in Paragraph 12 so that proper working current will flow through the coils of track relay during wet weather or minimum ballast resistance conditions. Checks shall be made to determine that under these conditions and during dry weather or maximum ballast resistance conditions the current flowing through the coils of track relay shall not exceed 40 milli-amperes for 2 ohm relays with train shunt applied as specified in Paragraph 11-D.

2- Circuit Controllers

a. Switch circuit controllers shall be maintained and tested in accordance with instructions I-137.8.

3- Ballast, Rail and Bond Resistance

a. Ballast resistance shall be kept as high as possible by keeping a clear space of at least one inch between such material and base of rail and fastenings. At road crossings, platforms, etc. where it is important to keep the rail clear, the mud or dirt shall be removed and clean gravel or stone ballast substituted. If adverse ballast condition exists and track circuit fails to function properly when adjusted in accordance with Paragraph 12, the signal maintainer will promptly report the matter to the Signal Supervisor.

b. Bonding shall be installed and maintained in condition to insure low resistance. Bolts in angle bars shall be kept tight.

c. Resistance of rails and bonding per 1000 feet of track should not exceed 0.05 ohms.

d. Resistance of ballast should preferably be not less than 2 ohms per 1000 feet of track when wet.

4- Batteries

a. Batteries shall be maintained and tested in accordance with current instructions I-111, I-112, I-113, I-139.

5- Rectifiers

a. Rectifiers shall be maintained and tested in accordance with current instructions I-114.

6- Bonding

a. Bonds shall be inspected frequently as instructed and those found defective promptly replaced.

b. Rail connectors shall be inspected frequently to determine that connection is securely tightened and properly formed, bootlegs properly maintained and located so as to prevent damage from dragging equipment.

c. Temporary bonds shall be used only during emergencies of short duration and when applied by the track forces the signal maintainer shall be promptly notified.

d. Rail joint bonding, shall conform to current Standard Plan S-127.

e. Frogs and switch bonding shall conform to current Standard Plan S-138.

f. Shunt wires shall be kept in place and in good condition.

g. Fouling circuits shall be so maintained as to avoid breaks or undue resistance.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept.27,1951

7- Insulated Rail Joints

a. The track supervisor is responsible for the proper installation and maintenance of insulated rail joints. He shall instruct the track foreman in regard to the manner of installation and maintenance of the joints.

b. Insulated rail joints must be installed in accordance with the special directions governing the particular type of joint used. Care must be exercised to properly put together the joints and apply them to the rail so as to insure a perfect fit and perfect insulation.

c. Rail ends shall be square (sawed) and must not be allowed to lip or flow so as to bridge across the fibre end posts. One 3/8" end post must be used and the ends of rail laid and maintained tight against the end posts.

d. Where there is a tendency to rail creeping, sufficient anti-creepers must be used to keep the ends of the rails in proper relation to each other.

e. Special attention must be given to keep the ballast to standard section, and well drained at all insulated joints.

f. The track foreman or track walker must examine all insulated joints frequently. If any defects are found they shall make the necessary repairs, giving particular attention to the insulation, renewing all worn fibres, etc.

g. The track foreman shall carry a supply of insulated joints and parts on each section where insulated joints are used.

h. The signal supervisor and signal maintainer must frequently examine all insulated joints in his territory, and if joints are not properly maintained, must see that proper action is taken promptly, reporting same to the track supervisor.

i. To test single end insulated joints between adjacent track circuits or from track circuit to dead section, connect voltmeter between rails at relay end of track circuit and then connect shunt wire from north or east rail of one (1) circuit to south or west rail of adjacent circuit or track and vice versa. If the voltmeter shows marked decrease in voltage when shunt wire is applied the defective insulated joint should be taken off and examined. See instruction I-115 for method of testing double end insulated joints, switch rods, front rods, gauge plates and pipe line insulations.

8- Rail Renewals

a. When rail is being laid or other track changes are being made which render the track unsafe for the passage of trains, the track relay must be disconnected and the signals governing over the track affected must be secured to display their most restrictive indications. When rail is being laid and the person in charge of the rail laying notifies the maintainer in writing that track is safe for the movement of trains, the track relay may be reconnected temporarily for train movement. The track relay must then be again disconnected while train is occupying track circuit. This procedure shall be continued until rebonding is complete and the surface of the rails is sufficiently clean and bright to insure proper shunting.

b. Under no circumstance shall the signal lighting circuit be disconnected while renewing rail.

9- Relays

a. Relays must be maintained and tested in accordance with current Instructions for Direct Current Relays, I-105 and I-106.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 27, 1951

10- Foreign Current

a. Track circuits shall be tested frequently for the presence of foreign current.

b. Method of Testing

(1) With track battery disconnected the track relay should release. If relay fails to release immediately shunt the track circuit for thirty seconds. Upon removal of shunt relay should then remain de-energized, but if it picks up, report the matter immediately to the Signal Supervisor who will take the necessary action.

11- Shunting Sensitivity

a. Union Switch and Signal Co. track shunting resistor complete with rail clamps and connections - Style S.B.M. 189436, C-9467, Sheet 1, or other approved type, shall be used in making shunting sensitivity tests.

b. Shunting tests of all track circuits shall be made annually during dry weather conditions when the maximum current is flowing through the relay coils.

c. Shunting tests must be made at least quarterly at the clearance point of turnouts and on both sides of insulated joints of crossovers insulated in center by using 16 ft. of No. 16 A.W.G. soft drawn copper wire.

d. Shunting sensitivity test of track circuit shall be made by determining the maximum resistance across the rails that will cause the relay front contacts to open. Relay must release on not less than 0.06 ohm shunt. Tests for each track circuit shall be recorded on Form 921-H provided for this purpose.

e. Shunt to be applied at end of track circuit where relay being tested is located. If reading is less than 0.1 ohm, repeat test with shunt applied at opposite end of circuit. Where track circuits are center fed repeat shunt at center.

f. Non-coded circuits employing head end relay at battery feed to be listed on Form 921-H and tested for shunting separately as above.

g. Coded track circuits without inverse code, apply shunt as in paragraph (e), observing voltage on track relay and shunt resistance at instant H relay releases.

h. Coded track circuits having inverse code, paragraph (g) applies at H relay end. Inverse track relay to be tested separately and shunt applied as in paragraph (e). Observe voltage on inverse track relay and shunt resistance when it releases.

i. Where signals are approach lighted, observance that signal ahead lights up is not insurance that the relay under test has fully released unless lamps are lighted through back contacts of relay under test.

12- Adjustment of Track Circuits

a. Track circuits shall be adjusted during or immediately following a heavy rainfall when ballast resistance is at its minimum. Under these conditions the adjustable resistor shall be adjusted so as to permit a current twenty percent in excess of the working current to flow through the coils of the relay.

b. To insure satisfactory shunting under dry or frozen ballast conditions, the minimum resistance between battery and track, inclusive of resistor, leads, contacts, etc. expressed in ohms, must be not less than the value shown in table 1.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 27,1951

c. To determine the total resistance between battery and track in ohms, divide the difference between the battery volts and volts at rails by the current flow to track.

Example 1 -

Battery volts	2.15
Rail volts	0.73
Difference	1.42
Amperes to track	0.620

Total resistance between battery and track 1.42 ÷ 0.62 = 2.29 ohms. Since the resistance in ohms is greater than the value shown in table 1, the resistance is sufficient to meet this instruction.

Example 2 -

Battery volts	1.20
Rail volts	0.60
Difference	0.60
Amperes to track	0.800

Total resistance between battery and track 0.60 ÷ 0.800 = 0.75 ohms. Since the resistance in ohms is less than the value shown in table 1, resistance is insufficient to meet this instruction.

TABLE 1

Maximum battery volts	Minimum allowable resistance in series between track battery and track in ohms
0.65	0.42
0.70	0.45
0.75	0.49
0.80	0.53
0.85	0.56
0.90	0.60
1.00	0.67
1.10	0.74
1.20	0.82
1.30	0.89
1.40	0.96
1.50	1.03
1.60	1.11
1.70	1.18
1.80	1.25
1.90	1.33
2.00	1.40
2.10	1.47
2.20	1.55
2.30	1.62
2.40	1.69
2.50	1.76

NOTE: If the maximum battery voltage is between values shown in the voltage column use the next higher voltage.

13- General

a. When track conditions are such that they may cause signal interruption or improper operation of track circuits the matter shall be reported by maintainer to signal supervisor in writing.

b. Pipe lines under rail must clear base of rail at least 1/2 inch.

c. Insulation in pipe line, switch rod, tie rod and gauge plate shall be maintained in good condition.

d. If a track circuit fails to operate properly, check against the following possible causes: -

  - (1) broken rail
  - (2) loose connection
  - (3) defects in bonding
  - (4) defects in insulated joints
  - (5) defects in switch rod, gauge plate or pipe-line insulation
  - (6) low resistance ballast

e. Except as herein provided for, changes must not be made in track circuits except with the approval of Chief Engineer Communications and Signals.

f. Any unusual occurrences or developments in track circuits must be promptly reported to signal supervisor.

g. Direct Current Track Circuit Test Record Form 921-G-Spl shall be properly filled in and furnished upon request.

5-16-51: New plans made account general re ons.

Approved: C.B. Harrison
Chief Eng'r. Maintenance
Approved:
Chief Eng'r. Comm.& Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 27, 1951

1- Track circuits must be adjusted as specified in Paragraph 12 so that proper working current will flow through the coils of track relay during wet weather or minimum ballast resistance conditions. Checks shall be made to determine that under these conditions and during dry weather or maximum ballast resistance conditions the current flowing through the coils of track relay shall not exceed 40 milli-amperes for 2 ohm relays with train shunt applied as specified in Paragraph 11-D.

2- Circuit Controllers

a. Switch circuit controllers shall be maintained and tested in accordance with instructions I-137.8.

3- Ballast, Rail and Bond Resistance

a. Ballast resistance shall be kept as high as possible by keeping a clear space of at least one inch between such material and base of rail and fastenings. At road crossings, platforms, etc. where it is important to keep the rail clear, the mud or dirt shall be removed and clean gravel or stone ballast substituted. If adverse ballast condition exists and track circuit fails to function properly when adjusted in accordance with Paragraph 12, the signal maintainer will promptly report the matter to the Signal Supervisor.

b. Bonding shall be installed and maintained in condition to insure low resistance. Bolts in angle bars shall be kept tight.

c. Resistance of rails and bonding per 1000 feet of track should not exceed 0.05 ohms.

d. Resistance of ballast should preferably be not less than 2 ohms per 1000 feet of track when wet.

4- Batteries

a. Batteries shall be maintained and tested in accordance with current instructions I-111, I-112, I-113, I-139.

5- Rectifiers

a. Rectifiers shall be maintained and tested in accordance with current instructions I-114.

6- Bonding

a. Bonds shall be inspected frequently as instructed and those found defective promptly replaced.

b. Rail connectors shall be inspected frequently to determine that connection is securely tightened and properly formed, bootlegs properly maintained and located so as to prevent damage from dragging equipment.

c. Temporary bonds shall be used only during emergencies of short duration and when applied by the track forces the signal maintainer shall be promptly notified.

d. Rail joint bonding, shall conform to current Standard Plan S-127.

e. Frogs and switch bonding shall conform to current Standard Plan S-138.

f. Shunt wires shall be kept in place and in good condition.

g. Fouling circuits shall be so maintained as to avoid breaks or undue resistance.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Signal Engineer
Baltimore, Md.
Sept.27,1951

7- Insulated Rail Joints

a. The track supervisor is responsible for the proper installation and maintenance of insulated rail joints. He shall instruct the track foreman in regard to the manner of installation and maintenance of the joints.

b. Insulated rail joints must be installed in accordance with the special directions governing the particular type of joint used. Care must be exercised to properly put together the joints and apply them to the rail so as to insure a perfect fit and perfect insulation.

c. Rail ends shall be square (sawed) and must not be allowed to lip or flow so as to bridge across the fibre end posts. One 3/8" end post must be used and the ends of rail laid and maintained tight against the end posts.

d. Where there is a tendency to rail creeping, sufficient anti-creepers must be used to keep the ends of the rails in proper relation to each other.

e. Special attention must be given to keep the ballast to standard section, and well drained at all insulated joints.

f. The track foreman or track walker must examine all insulated joints frequently. If any defects are found they shall make the necessary repairs, giving particular attention to the insulation, renewing all worn fibres, etc.

g. The track foreman shall carry a supply of insulated joints and parts on each section where insulated joints are used.

h. The signal supervisor and signal maintainer must frequently examine all insulated joints in his territory, and if joints are not properly maintained, must see that proper action is taken promptly, reporting same to the track supervisor.

i. To test single end insulated joints between adjacent track circuits or from track circuit to dead section, connect voltmeter between rails at relay end of track circuit and then connect shunt wire from north or east rail of one (1) circuit to south or west rail of adjacent circuit or track and vice versa. If the voltmeter shows marked decrease in voltage when shunt wire is applied the defective insulated joint should be taken off and examined. See instruction I-115 for method of testing double end insulated joints, switch rods, front rods, gauge plates and pipe line insulations.

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a. When rail is being laid or other track changes are being made which render the track unsafe for the passage of trains, the track relay must be disconnected and the signals governing over the track affected must be secured to display their most restrictive indications. When rail is being laid and the person in charge of the rail laying notifies the maintainer in writing that track is safe for the movement of trains, the track relay may be reconnected temporarily for train movement. The track relay must then be again disconnected while train is occupying track circuit. This procedure shall be continued until rebonding is complete and the surface of the rails is sufficiently clean and bright to insure proper shunting.

b. **Under no circumstance shall the signal lighting circuit be disconnected while renewing rail.**

9- Relays

a. **Relays must be maintained and tested in accordance with current Instructions for Direct Current Relays, I-105 and I-106.**

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Signal Engineer
Baltimore, Md.
Sept. 27, 1951

10 - Foreign Current

a. Track circuits shall be tested frequently for the presence of foreign current.

b. Method of Testing

(1) See B&O Rules, Standards and Instructions I-137, Sheet 1 Paragraph 137.3a.

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a. Union Switch and Signal Company track shunting resistor complete with rail clamps and connections - Style S.B.M. 189436, C-9467, Sheet 1, or other approved type, shall be used in making shunting sensitivity tests.

b. Shunting tests of all track circuits shall be made annually during dry weather conditions when the maximum current is flowing through the relay coils.

c. Shunting tests must be made at least quarterly at the clearance point of turnouts and on both sides of insulated joints of crossovers insulated in center by using 16 ft. of No. 16 A.W.G. soft drawn copper wire.

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e. Shunt to be applied at end of track circuit where relay being tested is located. If reading is less than 0.1 ohm, repeat test with shunt applied at opposite end of circuit. Where track circuits are center fed repeat shunt at center.

f. Non-coded circuits employing head end relay at battery feed to be listed on Form 921-H and tested for shunting separately as above.

g. Coded track circuits without inverse code, apply shunt as in paragraph (e), observing voltage on track relay and shunt resistance at instant H relay releases.

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b. To insure satisfactory shunting under dry or frozen ballast conditions, the minimum resistance between battery and track, inclusive of resistor, leads, contacts, etc. expressed in ohms, must be not less than the value shown in Table 1.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT
OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS
Office of Signal Engineer
Baltimore, Md.
Sept. 27, 1951

c. To determine the total resistance between battery and track in ohms, divide the difference between the battery volts and volts at rails by the current flow to track.

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Difference	1.42
Amperes to track	0.620

Total resistance between battery and track 1.42 ÷ 0.62 = 2.29 ohms. Since the resistance in ohms is greater than the value shown in table 1, the resistance is sufficient to meet this instruction.

Example 2 -

Battery volts	1.20
Rail volts	0.60
Difference	0.60
Amperes to track	0.800

Total resistance between battery and track 0.60 ÷ 0.800 = 0.75 ohms. Since the resistance in ohms is less than the value shown in table 1, resistance is insufficient to meet this instruction.

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1.60	1.11
1.70	1.18
1.80	1.25
1.90	1.33
2.00	1.40
2.10	1.47
2.20	1.55
2.30	1.62
2.40	1.69
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NOTE: If the maximum battery voltage is between values shown in the voltage column use the next higher voltage.

13- General

a. When track conditions are such that they may cause signal interruption or improper operation of track circuits the matter shall be reported by maintainer to signal supervisor in writing.

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c. Insulation in pipe line, switch rod, tie rod and gauge plate shall be maintained in good condition.

d. If a track circuit fails to operate properly, check against the following possible causes:

   (1) broken rail
   (2) loose connection
   (3) defects in bonding
   (4) defects in insulated joints
   (5) defects in switch rod, gauge plate or pipe-line insulation
   (6) low resistance ballast

e. Except as herein provided for, changes must not be made in track circuits except with the approval of Signal Engineer.

f. Any unusual occurrences or developments in track circuits must be promptly reported to signal supervisor.

g. Direct Current Track Circuit Test Record Form 921-G-Spl. shall be properly filled in and furnished upon request.

Approved: ARiley
Chief Engineer
Construction & Maintenance

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR THE MAINTENANCE & ADJUSTMENT OF CONVENTIONAL NON-CODED DIRECT CURRENT TRACK CIRCUITS

Office of Signal Engineer
Baltimore, Md.
Sept. 27, 1951.

5-16-51: New plans made account general r sions.

Name	Use	Ordering Reference
Sealing Compound	For filling conduit around low voltage underground cables, pot heads, etc.	Fusible asphaltic base sealing compound, A.A.R. Spec. 184.
"Duxseal"	For sealing cable and wire entrances of relay cases, junction boxes, etc.	Johns-Manville Company.
Graphite Cement Black	For sealing ATS inductors, cases and coils against the entrance of moisture.	Adams Paint Co., Cleveland.
Ruberoid Rapid Asphalt Paint	For painting wire and cable splices.	B.& O. Stock W-151.
Parolite	Sealing compound used around the cores of relays, etc.	General Railway Signal Co.
20th Century Marine Glue	Sealing compound used around the binding posts of relays.	General Railway Signal Co.

BALTIMORE & OHIO RAILROAD

SEALING COMPOUNDS USED BY SIGNAL DEPARTMENT

Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

Sheet No. 1

I-102-A

Name	Use	Ordering Reference
Black Sealing Wax	Sealing covers of Union Switch & Signal Company's relays.	U.S.& S. Co. Spec. 2065.
3/4" Okonite Splicing Compound	Splicing wire and cable.	The Okonite Company

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

SEALING COMPOUNDS USED BY SIGNAL DEPARTMENT

Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

Sheet No. 2

I-102-A

Made & Corrected 6-24-49

B. & O. R. R.

D.C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V				
	A				
Min. drop-away without contact pressure	V				
	A				
Min. drop-away	V				
	A				
Min. pick-up	V				
	A				
Max. Starting	V	8		9	
	A				
Code Rate at 10.0 Volts		73-77		72-78	
Contact Resistance Ohms		.02	.02	.05	.05

Min. physical air gap: Neutral ______ in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F	SP	to	SP	.031 in.	1.25 oz.	.010 in.
B	SP	to	SP	.031	1.25	.010 in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Por. ______)
Manuf., Spec.: General ATS-CT-10ME-3 Individual 57090-65
Remarks:
10 volt code transmitter.
With rotor at rest all lower contacts should be open.

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	K	4	57090-65	2

Magnetic structure Silicon

KIND	RESISTANCE	CONTACTS			
Code Transmitter 75 Rate	150 ohms	2 F	2 B	N	R
	ohms		FB		NR
	ohms				

DATE 9/1/49 TABLE NO. 70

B. & O. R. R.

D. C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V				
	A				
Min. drop-away without contact pressure	V				
	A				
Min. drop-away	V				
	A				
Min. pick-up	V				
	A				
Max. Starting	V	8		9	
	A				
Code Rate at 10.0 Volts		119-121		118-122	
Contact Resistance Ohms		.02	.02	.05	.05

Min. physical air gap: Neutral ______ in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F	SP	to	SP	.031 in.	1.25 oz.	.010 in.
B	SP	to	SP	.031	1.25	.010 in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Par. ______)
Manuf., Spec.: General ATS-CT-10ME3 Individual 57090-66
Remarks:
10 volt code transmitter.
With rotor at rest all lower contacts should be open.

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	K	4	57090-66	2

Magnetic structure Silicon

KIND	RESISTANCE	CONTACTS			
Code Transmitter 120 Rate	150 ohms	2 F	2 B	N	R
	ohms		FB		NR
	ohms				

DATE 9/1/49 TABLE NO. 71

B. & O. R. R.

D. C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V				
	A				
Min. drop-away without contact pressure	V				
	A				
Min. drop-away	V				
	A				
Min. pick-up	V				
	A				
Max. Starting	V	8		9	
	A				
Code Rate at 10.0 Volts		179-181		178-182	
Contact Resistance Ohms		.02	.02	.05	.05

Min. physical air gap: Neutral ______ in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F	SP	to	SP	.031 in.	1.25 oz.	.010 in.
B	SP	to	SP	.031	1.25	.010 in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Par. ______)
Manuf., Spec.: General ATS-CT-10ME-3 Individual 57090-67
Remarks:
10 volt code transmitter.
With rotor at rest all lower contacts should be open.

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	K	4	57090-67	2

Magnetic structure Silicon

KIND	RESISTANCE	CONTACTS			
Code Transmitter 180 Rate	150 ohms	2 F	2 B	N	R
	ohms		FB		NR
	ohms				

DATE 9/1/49 TABLE NO. 72

B. & O. R. R.

D.C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V	12			
	A				
Min. drop-away without contact pressure	V				
	A				
Min. drop-away	V	8.4		6.7	
	A				
Min. pick-up	V	10.8		11.9	
	A				
Max. pick-up	V				
	A				
Max. working	V				
	A				
Max. polar pick-up and working	V				
	A				

Min. physical air gap: Neutral .027 in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F	S	to	S	in.	1.75 oz.	.050 in.
B	S	to	S	XXXX	XXXX	in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Par. ______)
Manuf., Spec.: General GES 1-51 Individual ATS-DCR-10M-140
Remarks:

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	K	4	53000-137	4

Magnetic structure Silicon

KIND	RESISTANCE	CONTACTS			
Power Transfer	50 ohms	__ F	__ B	__ N	__ R
	50 ohms				
	______ ohms	4 FB		__ NR	

DATE 9/1/49 TABLE NO. 73

B. & O. R. R.

D. C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V				
	A	.435			
Min. drop-away without contact pressure	V				
	A	.029			
Min. drop-away	V				
	A	.054		.045	
Min. pick-up	V				
	A				
Max. pick-up	V				
	A				
Max. working	V				
	A	.099		.109	
Max. polar pick-up and working	V				
	A				

Min. physical air gap: Neutral .013 in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F	agc	to	S	in.	1.75 oz.	.050 in.
B	S	to	S	XXXX	XXXX	in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Par. ______)
Manuf., Spec.: General GES 1-51 Individual ED 28623-7
Remarks:
Heavy duty front and back contacts.

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	K	4	53000-241	2

Magnetic structure Silicon

KIND	RESISTANCE	CONTACTS			
Neutral Track	2 ohms	__ F	__ B	__ N	__ R
	______ ohms				
	______ ohms	4 FB		__ NR	

DATE 9/1/49 TABLE NO. 74

B. & O. R. R.

D. C. RELAY REQUIREMENTS

OPERATING CHARACTERISTICS		MANUFACTURE Normal	MANUFACTURE Reverse	FIELD Normal	FIELD Reverse
Initial charge	V				
	A				
Min. drop-away without contact pressure	V				
	A				
Min. drop-away	V				
	A				
Min. pick-up	V				
	A				
Max. pick-up	V				
	A				
Max. working	V				
	A				
Max. polar pick-up and working	V				
	A				

Min. physical air gap: Neutral ______ in., Polar ______ in.
Flashes per minute ______ at ______ volts
Release time ______ sec. at ______ volts
Pick-up time ______ sec. at ______ volts
Max. reversal time ______ sec. at ______ volts

CONTACTS				COMPRESSION	PRESSURE	MIN. OPENING
F		to		in.	oz.	in.
B		to				in.
P		to		in.	oz.	in.

Contact cap'y (Non-in. load) ______ amps. at ______ volts (Par. ______)
Manuf., Spec.: General ______ Individual ATS-TU-10MD-12
Remarks:
Complete cycle in 15 to 45 seconds, at 13.2 volts. 1 normally open and 1 normally closed contact.

MANUFACTURE	TYPE	SIZE	DRAWING	GR.
GRS Co.	T class J	1	53610-28	10

Magnetic structure ______

KIND	RESISTANCE	CONTACTS			
Thermal	18.6 ohms	__ F	__ B	__ N	__ R
	______ ohms				
	______ ohms	__ FB		__ NR	

DATE 9/1/49 TABLE NO. 75

1- General.

a. Locks and their supports must be kept securely fastened so there will be no shifting due to operation of lever or latch.

b. Locks in service must have sufficient clearance between fixed and movable parts to insure free movement.

c. Covers must be kept in place and locked or sealed.

d. Bolts, nuts, dowels, screws, binding posts, rivets, nut locks, jam nuts, locking parts, etc., must be kept in place, in good condition, and tight.

e. Cotter pins of the proper size must be in place in holes provided for that purpose, must be in good condition and properly spread.

f. Edges of locking dogs and notches must be examined frequently and any having rounded or otherwise distorted locking surfaces must be replaced.

g. Lock plungers or dogs must not be lubricated.

h. Coils must be kept fixed in place to prevent movement due to vibration.

i. Armature end play must be maintained to not less than 0.010 nor more than 0.020 inch in direct current lock, and not less than 0.030 nor more than 0.035 inch in alternating current lock.

j. Magnetic air gap must not be changed in the field, and must in no case be less than that specified by the manufacturer for the particular type of lock.

k. Parts found defective and locks not meeting tests required by these instructions must be replaced.

2- Contacts.

a. Finger contacts must meet contact surfaces squarely.

(1) Contacts must have a slide movement of not less than 0.010 inch against contact surface.
(2) Contact opening must be not less than 0.050 inch.

3- Notches For Locks Applied To Mechanical Machines.

a. The notch in the quadrant or slide bar must be so maintained the locking face will meet squarely against the locking dog. Notch must be not less than 5/16 inch deep and of length to provide at least 1/4 inch back clearance. With lock de-energized, the locking dog or plunger must engage quadrant or slide bar at least 7/32 inch and must clear bottom of notch in quadrant or slide bar. When lock is energized the locking dog or plunger must clear top of slide bar or quadrant at least 1/32 inch.

4- Tests.

a. Meters for testing electric locks shall be checked frequently and calibrated when necessary.

b. Drop-away, pick-up and working values of electric locks must be made periodically as instructed and in accordance with Instructions I-105, paragraph 9a.

c. When making test of apparatus, proper instruments must be used, and it must be known that no unsafe conditions are set up by the application of testing equipment.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 12, 1948

d. Locks must be tested periodically, per Instructions I-120, to determine that they are effective with lock circuit open and mechanical locking released. Test must be made by moving lever several times from normal or reverse position at varying impacts against electric lock stop.

e. Locks of solenoid gravity drop type must be disassembled each 2 years and plunger, tube and other working surfaces cleaned to insure proper operation. When reassembled and in place they must be tested for free movement of plunger and locking mechanism and as required in paragraph 4d.

f. Locks must meet shop requirements when placed in service, except in an emergency, when locks meeting field requirements may be used.

g. Insulation test must be made between all current-carrying parts and lock frames. The insulation resistance must be not less than 1 megohm. When high potential shop tests are made, the voltage employed should be 80 per cent of the value specified for a new lock in Specification 99, AAR Manual Part 96.

h. Inspectors must record field readings on Form 968-E, which must be forwarded to Signal Engineer.

5- Latch Operated Lock Adjustment.

a. On mechanical interlocking levers locked in the normal or reverse position, the following clearances must be maintained:

(1) Latch block lift, to permit operation of lever, must be not less than 3/4 inch.
(2) With electric lock de-energized and mechanical locking released, and with force applied to lever latch, the latch block lift must be not less than 7/16 inch nor more than 1/2 inch.
(3) To insure that locking dog of the electric lock drops freely into locking notch before the mechanical locking is released, maximum looseness of mechanical locking must prevent the lever latch block from lifting more than 5/16 inch.
(4) The maximum movement of lever latch block, with lock quadrant or slide bar held stationary, must not exceed 1/8 inch.

b. Mechanical interlocking levers locked in the normal or reverse indication position must be adjusted to hold latch block not less than 5/8 inch from full down normal or reverse position as required by circuit plan.

6- Lever Operated Lock Adjustment.

a. On mechanical interlocking levers locked in the normal or reverse position, the following clearances must be maintained:

(1) With mechanical locking released, the lock must prevent lever from moving more than 3/4 inch measured on top surface of lever quadrant. Locking notch in slide bar must provide at least 1/8 inch back clearance from locking dog.
(2) To insure that the locking dog of the electric lock is in locking position before the mechanical locking is released, the mechanical locking under the loosest locking condition must prevent lift of lever latch block more than 7/16 inch.
(3) On forced drop lever locks the first 1/4 inch initial downward movement of the latch block must force the locking dog of the electric lock into locking engagement.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 12, 1948

b. Switch Levers (Model 2, and Model 2 unit lever, electric interlocking machines):

(1) With electric lock de-energized and mechanical locking released, the movement of the lever from normal toward reverse position must be 13/32 to 16/32 inch, and reverse toward normal 22/32 to 24/32 inch.
(2) To insure that locking dog will drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must not permit movement of lever from normal toward reverse position of more than 5/16 inch, and from reverse toward normal 9/16 inch.
(3) When equipped with forced drop feature the locking dog of the electric lock must be forced into the locking position before the final movement of the lever latch block toward the normal or reverse locking position.

c. Switch Levers (Model 14 power interlocking machine):

(1) With electric lock de-energized and mechanical locking released, adjust to permit longitudinal lock bar to move 3/16 inch.
(2) To insure that locking dog can drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must prevent more than 3/32 inch movement of longitudinal locking bar equivalent to 5 degree travel of the lever.
(3) The maximum movement of the longitudinal locking bar, with the locking segment and that portion of the shaft on which it is mounted held stationary, must not exceed 1/64 inch.

d. Switch indicating levers (Style S-8 electro-mechanical interlocking machine):

(1) With electric lock de-energized and mechanical locking released adjust to permit longitudinal lock bar to move 1/4 inch or equivalent to 8 degree travel of the lever.
(2) To insure that locking dog can drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must prevent more than 5/32 inch movement of longitudinal locking bar equivalent to 5 degree travel of lever.
(3) The maximum movement of the longitudinal locking bar, with the shaft and locking segment of the machine held stationary, must not exceed 1/16 inch as a result of lost motion in the driving connections.

APPROVED: ______________________
, CHIEF ENG'R. MAINTENANCE

APPROVED: ______________________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 12, 1948

1- General.

a. Locks and their supports must be kept securely fastened so there will be no shifting due to operation of lever or latch.

b. Locks in service must have sufficient clearance between fixed and movable parts to insure free movement.

c. Covers must be kept in place and locked or sealed.

d. Bolts, nuts, dowels, screws, binding posts, rivets, nut locks, jam nuts, locking parts, etc., must be kept in place, in good condition, and tight.

e. Cotter pins of the proper size must be in place in holes provided for that purpose, must be in good condition and properly spread.

f. Edges of locking dogs and notches must be examined frequently and any having rounded or otherwise distorted locking surfaces must be replaced.

g. Lock plungers or dogs must not be lubricated.

h. Coils must be kept fixed in place to prevent movement due to vibration.

i. Armature end play must be maintained to not less than 0.010 nor more than 0.020 inch in direct current lock, and not less than 0.030 nor more than 0.035 inch in alternating current lock.

j. Magnetic air gap must not be changed in the field, and must in no case be less than that specified by the manufacturer for the particular type of lock.

k. Parts found defective and locks not meeting tests required by these instructions must be replaced.

2- Contacts.

a. Finger contacts must meet contact surfaces squarely.

(1) Contacts must have a slide movement of not less than 0.010 inch against contact surface.
(2) Contact opening must be not less than 0.050 inch.

3- Notches For Locks Applied To Mechanical Machines.

a. The notch in the quadrant or slide bar must be so maintained the locking face will meet squarely against the locking dog. Notch must be not less than 7/32 inch deep and of length to provide at least 1/4 inch back clearance. With lock de-energized, the locking dog or plunger must engage quadrant or slide bar at least 3/16 inch and must clear bottom of notch in quadrant or slide bar. When lock is energized the locking dog or plunger must clear top of slide bar or quadrant at least 1/32 inch.

4- Tests.

a. Meters for testing electric locks shall be checked frequently and calibrated when necessary.

b. Drop-away, pick-up and working values of electric locks must be made periodically as instructed and in accordance with Instructions I-105, paragraph 9a.

c. When making test of apparatus, proper instruments must be used, and it must be known that no unsafe conditions are set up by the application of testing equipment.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

d. Locks must be tested periodically, per Instructions I-120, to determine that they are effective with lock circuit open and mechanical locking released. Test must be made by moving lever several times from normal or reverse position at varying impacts against electric lock stop.

e. Locks of solenoid gravity drop type must be disassembled each 2 years and plunger, tube and other working surfaces cleaned to insure proper operation. When reassembled and in place they must be tested for free movement of plunger and locking mechanism and as required in paragraph 4d.

f. Locks must meet shop requirements when placed in service, except in an emergency, when locks meeting field requirements may be used.

g. Insulation test must be made between all current-carrying parts and lock frames. The insulation resistance must be not less than 1 megohm. When high potential shop tests are made, the voltage employed should be 80 per cent of the value specified for a new lock in Specification 99, AAR Manual Part 96.

h. Inspectors must record field readings on Form 968-E, which must be forwarded to Signal Engineer.

5- Latch Operated Lock Adjustment.

a. On mechanical interlocking levers locked in the normal or reverse position, the following clearances must be maintained:

(1) Latch block lift, to permit operation of lever, must be not less than 3/4 inch.
(2) With electric lock de-energized and mechanical locking released, and with force applied to lever latch, the latch block lift must be not less than 7/16 inch nor more than 1/2 inch.
(3) To insure that locking dog of the electric lock drops freely into locking notch before the mechanical locking is released, maximum looseness of mechanical locking must prevent the lever latch block from lifting more than 5/16 inch.
(4) The maximum movement of lever latch block, with lock quadrant or slide bar held stationary, must not exceed 1/8 inch.

b. Mechanical interlocking levers locked in the normal or reverse indication position must be adjusted to hold latch block not less than 5/8 inch from full down normal or reverse position as required by circuit plan.

6- Lever Operated Lock Adjustment.

a. On mechanical interlocking levers locked in the normal or reverse position, the following clearances must be maintained:

(1) With mechanical locking released, the lock must prevent lever from moving more than 3/4 inch measured on top surface of lever quadrant. Locking notch in slide bar must provide at least 1/8 inch back clearance from locking dog.
(2) To insure that the locking dog of the electric lock is in locking position before the mechanical locking is released, the mechanical locking under the loosest locking condition must prevent lift of lever latch block more than 7/16 inch.
(3) On forced drop lever locks the first 1/4 inch initial downward movement of the latch block must force the locking dog of the electric lock into locking engagement.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

b. Switch Levers (Model 2, and Model 2 unit lever, electric interlocking machines):

(1) With electric lock de-energized and mechanical locking released, the movement of the lever from normal toward reverse position must be 13/32 to 16/32 inch, and reverse toward normal 22/32 to 24/32 inch.
(2) To insure that locking dog will drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must not permit movement of lever from normal toward reverse position of more than 5/16 inch, and from reverse toward normal 9/16 inch.
(3) When equipped with forced drop feature the locking dog of the electric lock must be forced into the locking position before the final movement of the lever latch block toward the normal or reverse locking position.

c. Switch Levers (Model 14 power interlocking machine):

(1) With electric lock de-energized and mechanical locking released, adjust to permit longitudinal lock bar to move 3/16 inch.
(2) To insure that locking dog can drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must prevent more than 3/32 inch movement of longitudinal locking bar equivalent to 5 degree travel of the lever.
(3) The maximum movement of the longitudinal locking bar, with the locking segment and that portion of the shaft on which it is mounted held stationary, must not exceed 1/64 inch.

d. Switch indicating levers (Style S-8 electro-mechanical interlocking machine):

(1) With electric lock de-energized and mechanical locking released adjust to permit longitudinal lock bar to move 1/4 inch or equivalent to 8 degree travel of the lever.
(2) To insure that locking dog can drop freely into notch with reasonable clearance, the mechanical locking under the loosest locking condition must prevent more than 5/32 inch movement of longitudinal locking bar equivalent to 5 degree travel of lever.
(3) The maximum movement of the longitudinal locking bar, with the shaft and locking segment of the machine held stationary, must not exceed 1/16 inch as a result of lost motion in the driving connections.

Approved: C. Riley
~~Chief~~ Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR ELECTRIC LOCKS
APPLIED TO INTERLOCKING MACHINES
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

Made & Corrected 5-12-48
4-6-54: Paragraph 3a revised.
6-13-57: Paragraph 3a revised.

1- SPECIFICATIONS - Locking bars in new locking must have full stroke as follows

- (a) Mechanical interlocking machine S.&.F. locking ....1-3/4"
- (b) Mechanical interlocking machine Style "A" locking ....7/16"
- (c) Electro-mechanical interlocking machine, S.&.F. locking.
  - 1- Lever with full stroke having S.&.F. driver ....1-3/4"
  - 2- Lever normally center having rack driver ....2-5/8"
- (d) Electro-mechanical interlocking machine, S.&.F. miniature locking ....1-1/16"
- (e) Electro-mechanical interlocking machine (Style "A" miniature locking).
  - 1- Vertical locking ......1/4"
  - 2- Horizontal locking ....11/32"
- (f) Power interlocking machine, S.&.F. miniature locking..1-1/16"
- (g) Power interlocking machine, (Style "A" miniature locking)
  - 1- Vertical locking.......1/4"
  - 2- Horizontal locking.....11/32"
- (h) Table interlocking machines-
  - 1- Type "A"
    - (a) Vertical locking....7/32"
    - (b) Horizontal locking.1-1/2"
  - 2. Type "TC" ....1-1/16"

2- MINIMUM REQUIREMENTS - When lever or latch which should be locked can be moved more than shown below, it must be considered as having too much lost motion and lost motion must be removed.

- (a) Mechanical machine.
  - 1- Latch operated locking. When lever latch block can be lifted more than 3/8 inch from the bottom of the notch on levers not fitted with electric locks. On levers fitted with electric locks, when lever latch block can be lifted more than 5/16 inch from the bottom of the notch.
  - 2- Lever operated locking. When lever latch block can be moved more than 3/8 inch on top of quadrant.
  - 3- Latch block adjustment as follows:
    - (a) Latch block must not lift more than 1/16 inch above top of quadrant.
    - (b) Latch block lift to permit operation of lever must be not less than 3/4 inch.
- (b) Electro-mechanical machine.
  - 1- Lever moving in horizontal plane. When lever can be moved more than 3/16 inch when in normal position or 7/16 inch when in reversed position.
  - 2- Lever moving in an arc. When lever can be moved more than 5 degrees, equivalent to 1/4 inch movement of the latch on the quadrant.
- (c) Power Machine.
  - 1- Latch operated locking. When lever latch block can be raised to within 7/32 inch of top of quadrant.
  - 2- Lever moving in horizontal plane. When lever can be moved more than 5/16 inch when in normal position or 9/16 inch when in reversed position.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR
MECHANICAL LOCKING

Office of Signal Engineer
Baltimore, Md.
Aug. 22, 1958.

(c) Power Machine. (Contd.)

3- Lever moving in an arc. When lever can be moved more than 5 degrees, equivalent to 11/64 inch movement of the lever latch on quadrant.

3- TESTS - When new locking is to be placed in service or a change in locking is made, a complete check and test must be made of the locking as follows:

(a) With all levers normal see that locking agrees with the dog chart.

(b) Levers must be tested to see that each lever when reversed and latch down, locks all other levers in the position as required by the locking sheet.

(c) Complete test of the locking from a signal layout or interlocking plan must be made as follows:

1- Test locking between switch, derail, and movable point frog levers.

2- Test locking between facing point lock and switch, derail and movable point frog levers.

3- Set up each route and endeavor to reverse each signal lever that should be locked by that route; then reverse signal lever, governing movements over route and endeavor to operate each lever that should be locked by the signal lever; then restore lever to normal position and make similar test with lever for the opposing signal.

4- Parallel routes or other routes must be set up and signal levers operated for movements in both directions on each route to insure that the locking of one route does not interfere with other routes.

5- These tests require that the lever latch must be fully down with lever in proper position.

See I.C.C. Rules 136.335 to 136.341 inclusive.

Approved: C. Riley
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR MECHANICAL LOCKING

Office of Signal Engineer
Baltimore, Md.
Aug. 22, 1958.

ISSUED: Dec. 1, 1950
RETYPED: Aug. 22, 1958

Paragraphs 9, and 21 revised 4/17/51

A- Unpacking and Handling

1. Manufacturers' instructions must be followed in unpacking and handling. Handle carefully, avoid tilting, and do not lift cells by grasping cell posts or covers.
2. Cells must be shipped to the point of consignment in fully charged condition.

3. Upon delivery, examine electrolyte level or height to see that none is spilled. If cells are not unpacked at once, remove strip on side of crate provided for inspection which allows level to be checked. If electrolyte has been lost in transit and level is higher than 1/2 inch below top of plates, add distilled, or approved water or electrolyte of the same specific gravity for other cells of the same type and shipment. If the level is lower than 1/2 inch below top of plates, the cell may be permanently damaged and must not be installed until tests indicate otherwise.

4. If the battery is to be temporarily stored, place in a dry, clean location where the temperature will be not less than 32 degrees F. or more than 110 degrees F.

5. Cells must not be allowed to stand idle for more than 30 days. They must be charged periodically or floated continuously at a rate which will maintain an approximate voltage of 2.15, except Gould Plante type which must be maintained at 2.17 volts.

B- Installation and Maintenance

1. Before bolting the intercell connectors to the terminal posts of the battery, scrape the posts bright and clean. Then apply a thin film of No-Ox-Id grease which should also be put on the studs of the bolts. Wipe the lead plated copper intercell connector clean, but do not scrape it or use sandpaper, and apply a film of No-Ox-Id grease for about one inch around the bolt holes. If a lead intercell connector is supplied, scrape it for about one inch around the bolt holes, then apply a film of No-Ox-Id grease. Tighten bolt connection using care to avoid any strain on either connectors or terminals. Tighten connectors several times, then wipe off surplus grease. If standard connectors are not available, use #14 AWG rubber covered soft drawn copper wire (19 strand). The eye must be soldered when using stranded wire for this purpose.

2. Remove sealing compound from small holes in vent plugs. Make certain that all gas escape holes are open and left clean.

3. Starting from the negative terminal of the battery, identify the cells by stencilling a number on the cover, or rack.

4. Arrange the cells so that the positive terminal of one cell adjoins the negative of the next throughout the battery. Cells must be so arranged that edge of plates are visible for inspection.

5. To prevent damage to cells and connectors, a space of not less than 1/2 inch must be maintained between cell covers and between cell covers and adjacent objects.

6. After completing intercell connections, use voltmeter to determine that the positive terminal of each cell is connected to the negative terminal of adjacent cell. Arrange connections so that positive of charging source will connect with positive terminal of battery. Use direct current only for charging.

7. The specific gravity of each cell must be tested to determine that it is within the limits of 1,200 and 1.220 at 77 degrees F. To correct specific gravity readings for temperature variations, subtract .001 for each 3 degrees below 77 degrees F. and add .001 for each 3 degrees above 77 degrees F. If the electrolyte in any cell is below 1.190 at 77 degrees F. the cell must not be placed in service until given a complete charge. The specific gravity of electrolyte is accurately indicated only when it is at the proper high level.

8. After installation, cells must be charged at the maximum rated output of the rectifier and this charging rate continued until cells are fully charged. The voltage and specific gravity (corrected for temperature) of each cell must be recorded each week during original

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LEAD TYPE STORAGE BATTERY SEALED GLASS JAR - FLOATING CHARGE

Office of Chief Engineer Comm. & Signals
Baltimore, Md
April 17, 1951

charge on Battery Record Card, until 3 equal consecutive voltage readings are obtained in excess of 2.25 volts (corrected for temperature) per cell together with equal consecutive specific gravity readings equivalent to the recommended specific gravity for particular type of cell when fully charged.
At convenient intervals thereafter the output of the rectifier must be reduced in small steps until the voltage directly at the cell terminals remains generally at 2.17. The voltage may vary below or above this value according to traffic conditions; power interruptions, or atmospheric temperature, but should not be continually above or below this value. In cold weather the voltage of the battery rises inherently and it lowers with the return of warmer weather. If the floating voltage (voltage across battery on charge) increases in cold weather more than shown below, decrease charge rate

Temperature of Electrolyte	60°F	50°F	40°F	30°F	20°F	10°F	0°F
Maximum cell voltage	2.19	2.22	2.26	2.30	2.33	2.37	2.40

If the floating voltage decreases in warm weather less than shown below, increase charge rate

Temperature of Electrolyte	80°F	90°F	100°F	110°F	120°F	130°F
Maximum cell voltage	2.12	2.08	2.05	2.01	1.98	1.94

9. After original charge, the voltage of each cell must be taken monthly, or more frequently where conditions require, and recorded on Battery Record Card.

10. If the battery is being floated at the approximate correct rate, cells will show small gas bubbles rising in fairly slow succession from the top edges of the plates. An abundance of bubbles hurriedly forcing themselves to the top of the electrolyte and rippling the surface of the liquid is an indication of overcharging. Large bubbles forming at the bottom of the element to later sweep upwards indicates extreme overcharging. The positive plates in a healthy cell are dark brown in color.

11. It is unnecessary to take or record the rectifier output except in case of adjustment. Avoid frequent adjustments of rectifier.

12. A temperature change from 100 degrees F. to 20 degrees F. decrease the capacity of a cell 50%. Therefore, frequent inspections during cold weather are necesssary to determine that the battery is fully charged.

13. Electrolyte must not be permitted to fall below top of separators. Distilled or approved water must be used for replacing evaporation. With properly floated battery, water should be required only twice a year, preferably in the Spring and Fall to avoid danger of the water freezing. When necessary to add water during freezing weather the solution must be thoroughly agitated by a syringe so as to mix the water and electrolyte. When adding water, the level of the electrolyte must be brought up to the level line on the side of the jar. Specific gravity readings are misleading when the level of electrolyte falls 1/4 inch or more below the upper limit level. Never add special powder, solutions or jellies.

14. It should not be necessary to add electrolyte or acid during the life of the cell; however, in the event of spillage and upon instructions of the Signal Supervisor, use electrolyte of 1.210 specific gravity or equivalent value for the particular make and type of battery.

15. At yearly intervals, go over the connector bolts with socket wrenches, tightening them to insure good connections.

16. If a battery is discharged to any appreciable extent, by failure of the rectifier, power, or any other reason, the output of the rectifier must be increased to the maximum rating and proceed as outlined in Paragraph 8. It may be necessary to replace battery or use rectifier of larger capacity.

17. When necessary to renew the grease in the post seal, first clean

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LEAD TYPE STORAGE BATTERY SEALED GLASS JAR - FLOATING CHARGE

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 17, 1951

out the old material, wipe out the groove with a rag moistened with a solution of bicarbonate of soda and water, and then pour melted No-Ox-Id grease into the groove. Never use ordinary grease for this purpose as animal or vegetable grease is harmful.

18. Keep the battery, its connections, and surrounding parts clean and dry by wiping with a dry rag. Keep the vent plugs in place; make sure their gas escape holes are open. If electrolyte is spilled, or if surrounding parts are damp with acid, apply a solution of bicarbonate of soda (in the proportions of one pound of soda to one gallon of water); then rinse with water and dry; do not allow solution to get into cells. Soda solution or ammonia will neutralize the effect of acid on clothing.
If terminals or connectors show any tendency to corrode, scrape the corroded surface clean, wash it with the soda solution and coat it thinly with No-Ox-Id grease. No corrosion will be experienced unless electrolyte is spilled and allowed to remain.

19. Do not use a flame, spark, lighted cigar, cigarette, or pipe near the battery.

20. Water for electrolyte must be stored or transported only in approved containers provided for the purpose, and such containers must be kept clean, covered, and used for no other purpose.

21. If a jar is broken and the element exposed to the air, place the element in a clean wooden tub or bucket, glass or earthenware container filled with distilled water. If a new jar can be obtained within a week fill with battery electrolyte having a specific gravity of 1.150 and replace elements. Charge the battery at maximum rate until there is no increase in specific gravity readings after 3 consecutive weekly tests. Then replace electrolyte with battery electrolyte having a specific gravity of 1.210 and reassemble battery.
If the cell is to remain out of service longer than a week, the elements must be dismantled, the separators and negative groups kept in water and the positive group thoroughly dried. For shipment the negative group must be thoroughly dried after washing in clear water.

22. To prepare groups for shipment, wood blocks, the size of the plates and of a thickness equal to the distance between plates, must be inserted between the plates to prevent any strain on the plate lugs. The groups must be packed to prevent shifting. Sawdust or chips must not be used for packing.

Approved: ______________________
Chief Eng'r. Maintenance

Approved: ______________________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LEAD TYPE STORAGE BATTERY
SEALED GLASS JAR—FLOATING CHARGE
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 17, 1951

1- Housing

a. Cells must be protected against rain, snow, extreme heat or cold and should be kept clean.

b. Where freezing temperatures prevail for prolonged periods, outside housings shall be provided with frost covers and buried to such depth that the frost cover will be at or below the ground level.

c. Drainage must be provided to prevent flooding.

d. Cells must be set level on floors, shelves or racks. Where required, provision must be made to keep cells from shifting.

2- Material

a. (1) One complete cell (except water) must consist of the following:

1 jar	2 wing nuts
1 cover	2 washers
1 hexagonal nut	1 complete renewal

(2) One complete renewal must consist of the following:

1 element
1 can caustic soda
1 bottle battery oil (when not self-contained)

b. Renewals must not be removed from container until they are required.

c. Elements must not be lifted or carried by their connecting wires.

d. Renewals must be kept dry.

e. Caustic soda which has been damaged by exposure to air or dampness must not be used.

f. Renewals on hand for the longest period of time shall be used first.

3- Setting Up and Renewing Cells

a. Material must be checked to see that jars, covers, nuts, washers, elements, caustic soda and oil (when not self-contained) are of proper size and quantity.

b. Separators and other packing material must be removed from elements.

c. Elements must be examined to see that they hang approximately in a vertical position, that the electrodes are parallel to each other and uniformly spaced, and that connections are firmly made. Broken or cracked electrodes must not be used.

d. Jars and covers must be thoroughly cleaned. Cracked or defective jars or covers must not be used.

e. Material unfit for use must be reported to Signal Supervisor and held for instructions.

f. Clean water must be used for mixing solution; water known to contain acid, alkali, sewage or other impurities must not be used.

g. Jars must be filled with clean water to within 2-3/4 inches from the top or as specified in manufacturer's instructions.

h. Open can of caustic soda and dump entire contents into jar. Before soda has time to cake in bottom of jar, stir the solution in a circular and pendulum-like motion with a clean, narrow stick long enough to reach to the bottom of the jar, until all soda is dissolved. Be sure all soda is used and stirred until thoroughly dissolved.

i. The entire can of caustic soda, and only that furnished by the manufacturer for the type of renewal, must be used in each cell.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
COPPER-OXIDE TYPE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 30, 1947

SHEET NO. 1

3- Setting Up and Renewing Cells (contd.)

j. Connecting wire and suspension bolt must be passed through holes in cover and element securely tightened to cover by means of hexagonal nut. Two washers and two wing nuts must be placed above the hexagonal nut. Before applying element to cover, bend connecting wire so that it will pass freely through hole in cover to prevent damage to insulation. Avoid bending wire at point where it is connected to electrode.

k. The following proceedure shall be followed when batteries are used for standby or in the AC-Primary Battery System, to keep them in their most active condition. When first set up, or renewed, connect a series resistor across the battery for 15 minutes, and thereafter, for 5 minutes every two weeks or 10 minutes once each month. Batteries having a tendency to give lower than normal voltage at service rates of discharge, due to inactivity, should also be similarly treated. Each separate series of a multiple-series battery should be treated separately. The ohmic value of the resistor is governed by the number of cells connected in series as shown in the following table:

Number of Cells	RESISTOR VALUE IN OHMS
1	0.04
2 in series	0.04
3-5 in series	0.12
6-11 in series	0.25
12-22 in series	0.50

l. Element must be inserted in solution, where practicable, after jars have been placed in permanent position. When necessary, water must be added to bring top of solution, about 1/2 inch from top of jar with electrodes in position and stirred thoroughly by agitating entire bulk of solution by a brisk pendulum movement of narrow stick reaching to bottom of jar. Solution must not touch underside of cover, but must be well above top of electrodes. Insufficient stirring will result in lower voltage or shorter life, and will be indicated by premature dissolving of the lower portion of zinc due to the solution in lower part of jar being more concentrated.

m. Except when oil is self-contained, exact amount and kind furnished by manufacturer of renewal must be added to top of solution after element is permanently in place.

n. When oil is self-contained in electrodes or soda, immerse the assembled element in clean water for 2 or 3 minutes before passing through the oil layer into solution. Oil must not come in contact with dry element.

o. Cells must be arranged to permit of ready inspection of each cell or element. Element must not be raised into oil for inspection.

p. Cells must be connected as required by plans and instructions. Connections shall be clean and tight and must not be changed without proper authority.

q. Battery performance shall be recorded on Form 920A.

r. Except when necessary to make replacements of defective cells, all cells of a battery must be renewed at the same time.

s. When renewing or installing cells, care must be taken not to interfere with train operation.

t. **Use extreme care in mixing and handling the solution as it will burn the skin and clothing if allowed to come in contact. If splashed on the skin or clothing, wash off immediately with plenty of water.**

u. Discarded solution, cans and bottles must be disposed of where they will not damage property, inflict injury to persons, animals, etc., nor pollute any stream or source of water supply. Cans should be flattened out when emptied.

4- Inspections and Tests

a. Batteries must be inspected, tested and renewed as often as necessary to prevent failures. Voltage readings must be taken under full load to check their condition.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
COPPER-OXIDE TYPE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 30, 1947

4- Inspection and Tests (contd.)

b. Broken or cracked jars and covers must be replaced promptly.

c. Jars and covers must be clean and connections tight and free from corrosion.

d. Any unusual appearance or performance of cells must be promptly reported to Signal Supervisor.

e. When either elements or solution are defective, complete cell must be removed and saved intact on open circuit for investigation and Signal Supervisor promptly notified.

5- Exhausted Elements

a. Exhausted elements must be drained and then spaced on racks, floors, or shelves away from inflammable material until thoroughly dry, after which they must be placed in paper bags, if available, then packed and forwarded to the storehouse or other designated place. Each case must be marked to show the number and type of exhausted elements contained.

b. Exhausted elements must be kept dry as chemical action when wet may cause fire. Cases containing exhausted elements should be labeled "Keep Dry".

6- Usage Table

a. For track circuits use Edison type M-502, M-1002, or equivalent.

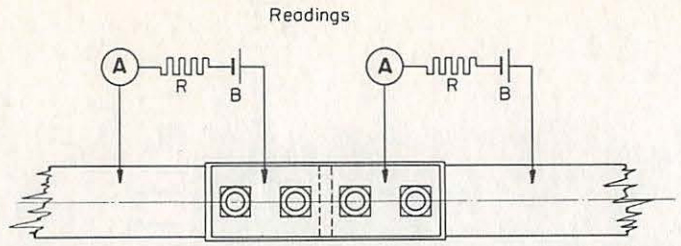
b. For semaphore signals electrically lighted use Edison type M-502, HA-902, or equivalent.

c. For color position light signals, flashing light signals, and flashing light signals with automatic short arm gates, use Edison type HA-902 or equivalent.

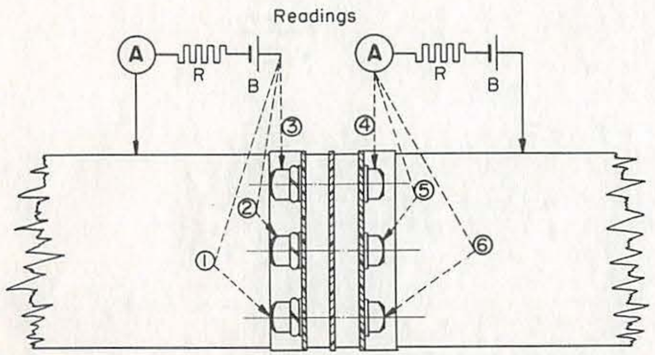
APPROVED: C.B. Harvers
CHIEF ENG'R. MAINTENANCE.

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
COPPER-OXIDE TYPE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 30, 1947



FRONT RODS - SWITCH RODS - GAUGE RODS - PIPE LINE INSULATIONS



GAUGE PLATE

NOTES:

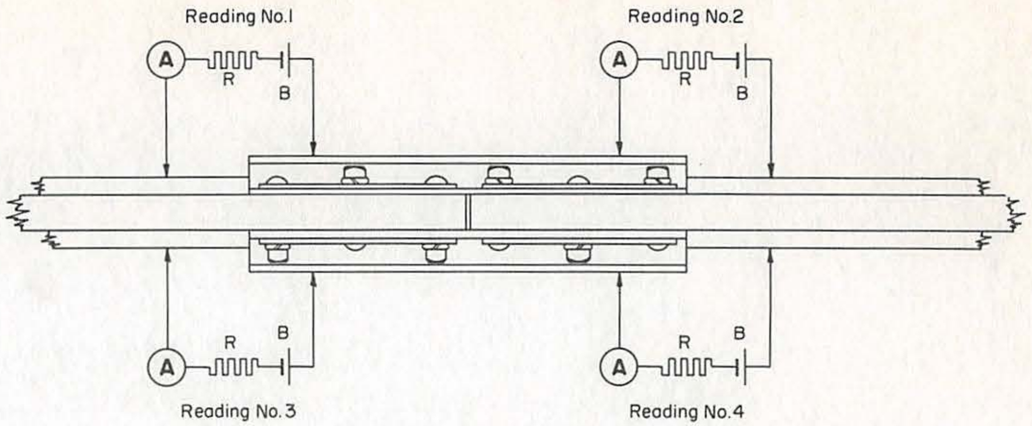
1 - Reading shall be taken when insulation is dry.

2 - When readings obtained exceed .020 amperes insulation shall be renewed, except for insulated joints.

3 - To determine total reading on insulated rail joint add the higher current reading obtained from reading No.1 and No.2 to the higher current reading obtained from reading No. 3 and No.4.

4 - On insulated rail joints, when total readings as determined from NOTE 3, exceed .020 amperes, the insulated rail joint shall be taken apart and rust throughly cleaned with a wire brush and defective insulation and insulating bushings renewed.

5 - Switch or front rod when connected at center must be disconnected from pipe line or switch machine and retested when readings obtained exceed .020 amperes.



FULL CONTINUOUS INSULATED RAIL JOINT

LEGEND

A = D.C. Milli-ammeter.
B = 1 Dry Cell (approx. 1.5 volts).
R = 2 to 8.5 ohms Resistance (for limiting current flow in case of broken down Insulation).

Approved:
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR TRACK INSULATION TESTS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 4, 1951.

I-115

1- General.

a. Lightning arrester grounds shall be provided where lightning arresters, designed for ground connection, are used to protect signal apparatus.

b. Ground rods and connecting parts shall be in accordance with Plan S-148.

2- Location and Arrangement.

a. Ground rod shall be located as close as practicable to lightning arresters but not closer than 3 feet from post, pole, or foundation except as modified in the following paragraph.

b. Where space is not available 3 feet from post, pole, or foundation to drive a rod vertically, the rod may be at an angle so that the lower end is more than three feet from post, pole, or foundation. If supplementary ground rod is required, it should be not less than 120 degrees around the obstruction from main rod and driven at same angle.

c. Top of ground rod shall be not more than 6 inches above surface of the earth.

d. One ground rod shall consist of not more than 3 sections.

e. Joint use of 1 ground rod for high voltage (more than 175 volts) arresters and low voltage (175 volts or less) arresters must be approved by the Chief Engineer of Communications and Signals.

f. Separate ground rods for high voltage and low voltage must be not less than 12 feet apart.

3- Resistance of Grounds.

a. The maximum resistance of grounds shall not exceed 15 ohms.

b. Where the desired resistance is not obtained with 1 ground rod of 3 sections, one or more supplementary ground rods, as necessary, shall be driven. Rods shall be located not less than 6 feet apart. Where supplementary ground rods are used, the spacing shall be 6 feet plus one-half the length of each additional supplementary rod. In such cases, the rod at the arrester location must be retained because it tends to reduce the inductive effect of a long wire extending to the more reliable ground.

c. Where arrester location is on top of fill and desired resistance of ground is not obtained with one 3 section ground rod at arrester location, supplementary ground rod or rods may be driven down the slope or at the foot of slope where good soil exists.

d. Where desired resistance cannot be obtained by using methods given above, the rails of non-signaled track may be used for ground element or one or more rods may be driven at an angle of 45 degrees under track, starting not less than 6 feet from nearest rail, retaining the rod at the arrester location.

e. Where the desired resistance is not obtained with a system of 3 multiple ground rods, the soil shall be treated as follows:

Dig a circular trench 15 inches wide, 18 inches deep, and 48 inches outside diameter around each rod; distribute 50 to 75 lbs. of rock salt, depending on soil resistivity, in the trench; flood trench with water two or three times and then replace the soil in the trench.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 18, 1948

SHEET NO. 1

I-117

f. Where ground resistance, within the allowable limits, cannot be maintained with the methods specified herein, the condition must be reported to the Chief Engineer Communications and Signals.

4- Driving.

a. Ground rod driver may be used where its use is practicable.

b. Where it is impracticable to use ground rod driver, coupling 1482 and driving stud 1483 shall be used.

c. The ground rod must be driven without bending and with minimum vibration.

d. When connecting sections of rod, the connection must be made in the coupling so that the upper section will bear solidly on top of the lower section.

e. The driving stud must be connected to bear solidly on top of the rod.

5- Ground Lead and Connections.

a. Ground lead between low voltage arrester ground post or bus and ground rod shall be soft-drawn copper wire No. 6AWG.

b. Ground lead between high voltage arrester and ground rod shall be soft-drawn copper wire No. 6 AWG unless otherwise specified by the Chief Engineer of Communications and Signals.

c. Ground rod and its supplementary ground rods shall be connected together with wire in accordance with 1485 Plan S-148.

d. Ground lead or rod connecting wire must be as short as practicable and shall not exceed 60 feet in length unless authorized by the Chief Engineer Communications and Signals.

e. Ground lead and rod connecting wire shall be run as directly as practicable, avoiding acute angles.

f. Ground lead shall be doubled back in clamp of ground rod.

g. Connections at ground rod shall be so placed that they will not be damaged by screw of ground rod clamp.

h. A 3/8 inch or more air space or equivalent insulation shall be provided between ground lead and low voltage circuits.

6- Grounding of Fixtures and Apparatus.

a. The following fixtures and apparatus shall be connected to ground rod:
   (1) Aerial cable suspension strand at signal locations, cut sections, and at intermediate locations where required.
   (2) Signal Masts, cantilevers, and bridges, except highway crossing signals.
   (3) Relay racks, and metal instrument and terminal cases, except where mounted on wood poles where case cannot be reached while standing on the ground.
   (4) Interlocking machines.
   (5) Line transformer case.
   (6) Metal raceways not attached to interlocking machine or other grounded objects.

7- Tests.

a. Ground resistance shall be measured at the time of installation and every two years thereafter with a ground megger.

b. Ground post of ground megger shall be connected to the ground post of the lightning arrester at the distant end of the ground lead so as to insure the continuity of the ground circuit.

APPROVED: C G Harrison
CHIEF ENG'R. MAINTENANCE

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 18, 1948

1. GENERAL

a. Lightning arrester grounds shall be provided where lightning arresters, designed for ground connection, are used to protect signal apparatus.

b. Ground rods and connecting parts shall be in accordance with Plan S-148-A.

2. LOCATION AND ARRANGEMENT

a. Ground rod shall be located as close as practicable to lightning arresters but not closer than 3 feet from post, pole, or foundation except as modified in the following paragraph.

b. Where space is not available 3 feet from post, pole, or foundation to drive a rod vertically, the rod may be at an angle so that the lower end is more than three feet from post, pole, or foundation. If supplementary ground rod is required, it should be not less than 120 degrees around the obstruction from main rod and driven at same angle.

c. Top of ground rod shall be not more than 6 inches above surface of the earth.

d. One ground rod shall consist of not more than 3 sections.

e. Joint use of 1 ground rod for high voltage (more than 175 volts) arresters and low voltage (175 volts or less) arresters must be approved by the Signal Engineer.

f. Separate ground rods for high voltage and low voltage must be not less than 12 feet apart.

3. RESISTANCE OF GROUNDS

a. The maximum resistance of grounds shall not exceed 15 ohms.

b. Where the desired resistance is not obtained with 1 ground rod of 3 sections, one or more supplementary ground rods, as necessary, shall be driven. Rods shall be located not less than 6 feet apart. Where supplementary ground rods are used, the spacing shall be 6 feet plus one-half the length of each additional supplementary rod. In such cases, the rod at the arrester location must be retained because it tends to reduce the inductive effect of a long wire extending to the more reliable ground.

c. Where arrester location is on top of fill and desired resistance of ground is not obtained with one 3 section ground rod at arrester location, supplementary ground rod or rods may be driven down the slope or at the foot of slope where good soil exists.

d. Where desired resistance cannot be obtained by using methods given above, the rails of non-signaled track may be used for ground element or one or more rods may be driven at an angle of 45 degrees under track, starting not less than 6 feet from nearest rail, retaining the rod at the arrester location.

e. Where the desired resistance is not obtained with a system of 3 multiple ground rods, the soil shall be treated as shown on Standard Plan S-172-A, Sheet 1.

f. Where ground resistance, within the allowable limits, cannot be maintained with the methods specified herein, the condition must be reported to the Signal Engineer.

4. DRIVING

a. Ground rod driver may be used where its use is practicable.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR
LIGHTNING ARRESTER GROUNDS

Office of Signal Engineer
Baltimore, Md.
July 28, 1958.

Sheet No. 1 I-117-B

4. CONTINUED

b. Where it is impracticable to use ground rod driver, coupling 1482 and driving stud 1483 shall be used.

c. The ground rod must be driven without bending and with minimum vibration.

d. When connecting sections of rod, the connection must be made in the coupling so that the upper section will bear solidly on top of the lower section.

e. The driving stud must be connected to bear solidly on top of the rod.

5. GROUND LEAD AND CONNECTIONS.

a. Ground lead between low voltage arrester ground post or bus and ground rod shall be soft-drawn copper wire No. 6AWG.

b. Ground lead between high voltage arrester and ground rod shall be soft-drawn copper wire No. 6 AWG unless otherwise specified by the Signal Engineer.

c. Ground rod and its supplementary ground rods shall be connected together with wire in accordance with 1485 Plan S-148-A.

d. Ground lead or rod connecting wire must be as short as practicable and shall not exceed 60 feet in length unless authorized by the Signal Engineer.

e. Ground lead and rod connecting wire shall be run as directly as practicable, avoiding acute angles.

f. Ground lead shall be doubled back in clamp of ground rod.

g. Connections at ground rod shall be so placed that they will not be damaged by screw of ground rod clamp.

h. A 3/8 inch or more air space or equivalent insulation shall be provided between ground lead and low voltage circuits.

6. GROUNDING OF FIXTURES AND APPARATUS.

a. The following fixtures and apparatus shall be connected to ground rod:

(1) Aerial cable suspension strand at signal locations, cut sections, and at intermediate locations where required.

(2) Signal Masts, cantilevers, and bridges, except highway crossing signals.

(3) Relay racks, and metal instrument and terminal cases, except where mounted on wood poles where case cannot be reached while standing on the ground.

(4) Interlocking machines.

(5) Line transformer case.

(6) Metal raceways not attached to interlocking machine or other grounded objects.

7. TESTS

a. Ground resistance shall be measured at the time of installation and every two years thereafter with a ground megger.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS

Office of Signal Engineer
Baltimore, Md.
July 28, 1958

7. CONTINUED

b. Ground post of ground megger shall be connected to the ground post of the lightning arrester at the distant end of the ground lead so as to insure the continuity of the ground circuit.

ISSUED - May 18, 1948
RETYPED - July 28, 1958

Approved: C Riley
Chief Engineer
Construction & Maintenance

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR
LIGHTNING ARRESTER GROUNDS
Office of Signal Engineer
Baltimore, Md.
July 28, 1958.

Sheet No. 3   I-117-B

1- General.

a. Lightning arresters shall be inspected frequently during the season of the year when lightning occurs.
b. Application and type of lightning arresters shall be in accordance with the following table:

Item	Use	Voltage Range		Manufacture	Ordering Reference
		A.C.	D.C.		
(1)	Signal control and track circuits	0-125	0-30	Railroad Accessories Corpn.	Raco Clearview No. 485-1 or 2.
(2)	Signal Power Transmission Lines	110-750		Electric Service Supplies Co.	Crystal valve double pole, Type Lc51081.
(3)	Signal Power Transmission Lines	1000-3000		General Electric Company	Pellet type with standard hanger, No. 9LA10A2.
(4)	Signal Power Transmission Lines	6000-9000		General Electric Company	Pellet type with standard hanger, No. 9LA10A5.

2- Installation.

a. Low-voltage lightning arrester shall be installed between conductor and ground on each open line, or track wire, entering relay case or building.
b. Low-voltage lightning arrester shall be installed between conductor and ground where open line wire connects to underground conductor.
c. High-voltage lightning arrester shall be installed between each primary lead and ground of high-voltage transformers.

3- Tests.

a. Rare gas lightning arresters shall be tested annually with test sets provided for this purpose.
b. Rare gas lightning arresters must be disconnected when meggering line control circuits. Other types of arresters may remain connected.

APPROVED: C B Harrison
CHIEF ENG'R. MAINTENANCE

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LIGHTNING ARRESTERS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD
MAY 21, 1948

Test No.	Test or Inspection	Rules & Instructions		Max. Time between Tests or Inspections	Inspection to be made by	Test to be made by	Recorded on Form No.	Disposition of Form	Remarks
		I.C.C. No.	B.&O. No.						
1	Grounds	136.2	137.1	1 Year		Signal Inspector	300 Ruled	Signal Engineer - Signal Supervisor	Test all line and operating batteries.
1a	Grounds	136.2	137.1	3 Months		Signal Maintainer	Log Book		Test all line and operating batteries. Circuits that cannot be cleared at once to be reported.
1b	Grounds	136.2	137.1	1 Month		Signal Maintainer	Log Book		Line and operating batteries at Interlockings.
2	Track circuit shunting sensitivity and adjustment.	136.56	I-101 and 137.2	1 Year		Signal Inspector and Signal Maintainer.	921-H	Signal Engineer - Signal Supervisor	
3	Track circuits, Note 2.		137.3	2 Months	Signal Maintainer		Log Book		
3a	Track circuits		I-101 and 137.3a	When necessary		Signal Insp. & Mn'tr.	921-H	Signal Engineer - Signal Supervisor	Foreign current test.
3b	Track circuits		I-101 and 137.3b	When required		Signal Insp. & Sup'r.	921-G-Spl.	Signal Engineer	D.C. track circuit test record.
4	Batteries-Storage, Note 2.		I-111, I-112 & 137.4	1 Month		Signal Maintainer	922-H-Spl.	Signal Supervisor	
4a	Batteries-Capacity test.		137.4a	1 Year		Signal Inspector	300 Ruled	Signal Engineer - Signal Supervisor	Lead plate battery.
4b	Batteries-Primary, Note 2.		I-113 and 137.4a	1 Month		Signal Maintainer	920-A	Signal Supervisor	
5	Arrester grounds	136.78	I-117 and 137.5	2 Years		Signal Insp. & Mn'tr.	912-E-Rev.	Signal Engineer - Signal Supervisor	
6	General inspection		137.6	4 Years	Signal Insp. & Mn'tr.		F-103	Signal Engineer	Report general conditions.
6a	General inspection foreign plants.		137.6a	4 Years	Signal Supervisor			Sig. Eng'r. – Ass't. Eng'r. Sigs.	Visual inspection. Report general conditions.
7	Signal mechanisms	136.102	137.7	2 Years		Signal Inspector	968-C	Signal Engineer - Signal Supervisor	
7a	Signal mechanisms, Note 2.	136.102	137.7a	1 Month	Signal Maintainer		912	Signal Supervisor	
8	Switch circuit controllers	136.103	137.8	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	
8a	Switch circuit controllers, Note 2.	136.103	137.8	1 Month	Signal Maintainer		Log Book		Check adjustment.
8b	Point detectors	136.334	137.8a	3 Months		Signal Sup'r. & Mn'tr.	968-D-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
9	Fouling circuits	136.104	137.9	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	
10	Insulated joints	136.59	137.10	1 Month	Signal Maintainer		Log Book		
11	Relays, D.C.	136.106	I-105, I-106 & 137.11	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer - Signal Supervisor	
11a	Electric locks	136.105	I-109 and 137.11a	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer - Signal Supervisor	Include forced drop type.
11b	D.C. apparatus, replacement.	136.109	137.11b		Signal Maintainer	Signal Inspector	921-E	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
12	Relays, A.C.	136.106	137.12	2 Years		Signal Inspector	968-F	Signal Engineer - Signal Supervisor	
12a	A.C. apparatus, replacement.	136.109	137.12a		Signal Maintainer	Signal Inspector	921-F	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
13	Arresters (Gas type)	136.107	137.13	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	
13a	Arresters (Other types)		137.13a	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	
13b	Arresters (all types)		137.13b	After each storm	Signal Maintainer		Log Book		
14	Insulation test	136.108	I-127 and 137.14	5 Years		Signal Insp. & Mn'tr.	968-G-Rev.	Signal Engineer - Signal Supervisor	Test all signals, wires and cables including power.
15	Signal pole line		137.15	2 Years	Signal Inspector		300 Ruled	Signal Engineer	
16	Mechanical locking	136.376	I-110 & 137.16	2 Years		Signal Insp. & Mn'tr.	300 Ruled	Signal Engineer - Signal Supervisor	Test after any locking change is made.
17	Approach locking	136.377	137.17	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
18	Time locking	136.378	137.18	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
19	Route locking	136.379	137.19	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
20	Indication locking, Signals	136.380	137.20	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
20a	Indication locking, Switches	136.380	137.20a	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
21	Traffic locking	136.381	137.21	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
22	Switch obstruction test	136.382	137.22	1 Month		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	
22a	Switch obstruction test	136.382	137.22	1 Year		Signal Sup'r. & Mn'tr.	968-K-Rev.	Ass't. Eng'r. Sigs. Signal Sup'r.	
22b	Observe switch repeating relays, operating correctly.			2 Years	Signal Inspector		300 Ruled	Signal Engineer.	Irregularities to be corrected at once.

BALTIMORE & OHIO RAILROAD

SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS AND INSPECTIONS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Oct. 6, 1950.

Sheet No. 1

I-120-A

Test No.	Test or Inspection	Rules & Instructions		Max. Time between Tests or Inspections	Inspection to be made by	Test to be made by	Recorded on Form No.	Disposition of Form	Remarks
		I.C.C.No.	B.&O.No.						
23	E.P. lockvalve test	136.383	137.23	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	
24	Cross protection test	136.384	137.24	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Electric interlocking G.R.S.Co.
24a	Cross protection test	136.384	137.24	1 Year		Signal Insp. & Mn'tr.	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	
25	Time releases & timing relays	136.385	137.25	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs. -Signal Sup'r.	
26	Restoring feature, power switches	136.386	137.26	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs. -Signal Sup'r.	
27	Bridge locking	136.387	137.27	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't Eng'r. Sigs. -Signal Sup'r.	
28	A.T.S. Inductor insulation test	136.576	137.28 & I-138	6 Months		Signal Sup'r. & Mn'tr.	968-P-Rev.	Ass't Eng'r. Sigs. - Signal Sup'r.	
28a	A.T.S. Inductor	136.576	137.28 & I-138	1 Month		Signal Maintainer	968-P-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	Height and alinement test.
29	Highway crossing signals & gates		137.29	1 Week		Designated Employee	912 or other	Designated Officer	Operating test.
29a	Highway crossing signals & gates		137.29a	2 Years	Signal Inspector	Signal Inspector	F-101	Signal Engineer - Signal Supervisor	Report general conditions. Torque test and operating characteristics.
30	Overload relays, switch machines.	136.8	137.30	3 Months		Signal Maintainer	Log Book		As per manufacturers instructions.
30a	Switch Machine Controllers	136.8	137.30a	2 Years		Signal Insp. & Mn'tr.	968-E -Rev.	Signal Engineer - Signal Supervisor	As per manufacturers instructions.
31	Brakes, switch machines.	136.8	137.31	1 Month		Signal Maintainer	Log Book		As per manufacturers instructions.
31a	Brakes, all types, switch machines.	136.8	137.31a	2 Years		Signal Insp. & Mn'tr.	968-E- Rev.	Signal Engineer - Signal Supervisor	As per manufacturers instructions.
32	Clutches, switch machines	136.8	137.32	3 Months		Signal Maintainer	Log Book		As per manufacturers instructions.
32a	Clutches, switch machines		137.32	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer-Signal Supervisor	
33	Service test		137.33			Sig. Insp. or person in charge		Signal Engineer	
34	Spring switch		137.34	1 Week		Signal Maintainer	Log Book		
34a	Spring switch		137.34a	1 Year		Signal Inspector	F-102	Signal Engineer-Signal Supervisor	
35	Traffic Control Systems		137.35	2 Years		Signal Inspector	F-100 shs. 1&2	Signal Engineer-Signal Supervisor	Type K, Class M.
35a	Traffic Control, all systems.	136.476	137.35a			Signal Maintainer		Ass't. Eng'r. Sigs. - Signal Sup'r.	

NOTES:

1- Signal Supervisor and Inspector will examine and sign Log Book at least annually.

2- Test or inspect at more frequent intervals if required by local conditions.

3- Signal Inspectors will report all appliances or conditions to be corrected on Form 922-E with copy to Signal Engineer, Assistant Engineer Signals, Division Engineer, and when required, to Signal Maintainer. If correction is made at time of inspection report will so indicate. If correction is to be made later, Assistant Engineer Signals will follow the condition to a prompt conclusion. When correction has been made he will so indicate on his copy of Form 922-E, which will then be forwarded to Signal Engineer.

4- When recording results on forms provided for a specific test indicate whether adjustment was required at time of test or inspection.

5- Matters pertaining to tests and inspections that are referred to Assistant Engineer Signals on the three principle regions will be handled on the B.&O.C.T. and Staten Island by the respective Signal Supervisor.

6- B.&O. Rules shall be followed when more restrictive than I.C.C. Rules.

7- Assistant Engineer Signals will discuss frequently with Supervisors and Maintainers those tests and inspections for which they are responsible and satisfy himself that the Instructions are understood and are being carried out.

8- Log Book to be Form 2016.

Approved: ______________
Chief Eng'r. Maintenance

Approved: ______________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS AND INSPECTIONS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Oct. 6, 1950

Sheet No. 2

I-120-A

New plan made account I.C.C. R ges. 10-6-50.

Test No.	Test or Inspection	Rules & Instructions		Max. Time between Tests or Inspections	Inspection to be made by	Test to be made by	Recorded on Form No.	Disposition of Form	Remarks
		I.C.C.No.	B.&O.No.						
1	Grounds.	136.2	137.1	1 Year		Signal Inspector	300 Ruled	Signal Engineer - Signal Supervisor	Test all line and operating batteries.
1a	Grounds.	136.2	137.1	3 Months		Signal Maintainer	Log Book		Test all line and operating batteries. Circuits that cannot be cleared at once to be reported.
1b	Grounds.	136.2	137.1	1 Month		Signal Maintainer	Log Book		Line and operating batteries at Interlockings.
2	Track circuit shunting sensitivity and adjustment.	136.56	I-101 and 137.2	1 Year		Signal Inspector and Signal Maintainer.	921-H	Signal Engineer - Signal Supervisor	
3	Track circuits, Note 2.		137.3	2 Months	Signal Maintainer		Log Book		Visual inspection
3a	Track circuits.		I-101 and 137.3a	When necessary		Signal Insp. & Mn'tr.	921-H	Signal Engineer - Signal Supervisor	Foreign current test.
3b	Track circuits.		I-101 and 137.3b	When required		Signal Insp. & Sup'r.	921-G-Spl.	Signal Engineer	D.C. track circuit test record.
4	Batteries-Storage, Note 2.		I-111, I-112 & 137.4	1 Month		Signal Maintainer	922-H-Spl.	Signal Supervisor	Visual inspection and voltage test.
4a	Batteries - Capacity test.		137.4a	1 Year		Signal Inspector	922-H-Spl.	Signal Engineer - Signal Supervisor	Lead plate battery.
4b	Batteries - Primary, Note 2.		I-113, I-139 & 137.4a	1 Month		Signal Maintainer	920-A	Signal Supervisor	Visual inspection and voltage test
5	Arrester grounds.	136.78	I-117 and 137.5	2 Years		Signal Insp. & Mn'tr.	912-E-Rev.	Signal Engineer - Signal Supervisor	Ground "Megger" test.
6	General inspection.		137.6	4 Years	Signal Insp. & Mn'tr.		F-103	Signal Engineer	Report general conditions.
6a	General inspection foreign plants.		137.6a	4 Years	Signal Supervisor			Sig. Eng'r. – Ass't. Eng'r. Sigs.	Visual inspection. Report general conditions.
7	Signal mechanisms.	136.102	137.7	2 Years		Signal Inspector	968-C	Signal Engineer - Signal Supervisor	Torque and operating test.
7a	Signal mechanisms, Note 2.	136.102	137.7a	1 Month	Signal Maintainer		912	Signal Supervisor	Clean, oil and adjust.
8	Switch circuit controllers.	136.103	137.8	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	Clean, lubricate and test.
8a	Switch circuit controllers, Note 2.	136.103	137.8	1 Month	Signal Maintainer		Log Book		Check adjustment.
8b	Point detectors.	136.334	137.8a	3 Months		Signal Maintainer	968-D-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	Clean and test.
9	Fouling circuits.	136.104	137.9	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	Test and inspect.
10	Insulated joints.	136.59	137.10	1 Month	Signal Maintainer		Log Book		Inspection.
11	Relays, D.C.	136.106	I-105, I-106 & 137.11	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer – Signal Supervisor	Operating test.
11a	Electric locks.	136.105	I-109 and 137.11a	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer - Signal Supervisor	Operating test, include forced drop type.
11b	D.C. apparatus, replacement.	136.109	137.11b		Signal Maintainer	Signal Inspector	921-E	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
12	Relays, A.C.	136.106	137.12	2 Years		Signal Inspector	968-F	Signal Engineer - Signal Supervisor	Operating test.
12a	A.C. apparatus, replacement.	136.109	137.12a		Signal Maintainer	Signal Inspector	921-F	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
13	Arresters (Gas type).	136.107	137.13	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	Voltage breakdown test.
13a	Arresters (Other types).		137.13a	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	"Megger" test.
13b	Arresters (all types).		137.13b	After each storm	Signal Maintainer		Log Book		Inspection
14	Insulation test.	136.108	I-127 and 137.14	5 Years		Signal Insp. & Mn'tr.	968-G-Rev.	Signal Engineer - Signal Supervisor	Test all signals, wires and cables including power.
15	Signal pole line.		137.15	2 Years	Signal Inspector		300 Ruled	Signal Engineer	Inspection.
16	Mechanical locking.	136.376	I-110 & 137.16	2 Years		Signal Insp. & Mn'tr.	300 Ruled	Signal Engineer – Signal Supervisor	Test after any locking change is made.
17	Approach locking.	136.377	137.17	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	Check and test.
18	Time locking.	136.378	137.18	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
19	Route locking.	136.379	137.19	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
20	Indication locking, Signals.	136.380	137.20	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
20a	Indication locking, Switches.	136.380	137.20a	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
21	Traffic locking.	136.381	137.21	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
22	Switch obstruction test.	136.382	137.22	1 Month		Signal Maintainer	968-Q	Ass't. Eng'r. Sigs. - Signal Sup'r.	" " "
22a	Switch obstruction test.	136.382	137.22	1 Year		Signal Sup'r. & Mn'tr.	968-Q	Ass't. Eng'r. Sigs. Signal Sup'r.	" " "

BALTIMORE & OHIO RAILROAD

SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS AND INSPECTIONS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Oct. 6, 1950.

Revised 3-14-51

Sheet No. 1

I-120-B

Test No.	Test or Inspection	Rules & Instructions		Max. Time between Tests or Inspections	Inspection to be made by	Test to be made by	Recorded on Form No.	Disposition of Form	Remarks
		I.C.C.No.	B.&O.No.						
23	E.P. lock valve test.	136.383	137.23	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Leakage Test.
24	Cross protection test.	136.384	137.24	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Electric interlocking G.R.S.Co.
24a	Cross protection test.	136.384	137.24	1 Year		Signal Insp. & Mn'tr.	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
25	Time releases & timing relays.	136.385	137.25	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Check time interval.
26	Restoring feature, power switches.	136.386	137.26	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	
27	Bridge locking.	136.387	137.27	1 Year		Signal Sup'r. & Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	
27a	Bridge locking.	136.387	137.27	3 Months		Signal Maintainer	Log Book		
28	A.T.S. Inductor test.	136.576	137.28 & I-138	6 Months		Signal Sup'r. & Mn'tr.	968-P-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Efficiency test.
28a	A.T.S. Inductor test.	136.576	137.28 & I-138	1 Month		Signal Maintainer	968-P-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Height and alinement test.
29	Highway crossing signals & gates.		137.29	1 Week		Designated Employee	912 or other	Designated Officer	Operating test.
29a	Highway crossing signals & gates.		137.29a	2 Years	Signal Inspector	Signal Inspector	F-101	Signal Engineer - Signal Supervisor.	Report general conditions. Torque test and operating characteristics.
30	Overload relays, switch machines.	136.8	137.30	3 Months		Signal Maintainer	Log Book		As per manufacturers instructions.
30a	Switch Machine Controllers.	136.8	137.30a	2 Years		Signal Insp. & Mn'tr.	968-E-Rev.	Signal Engineer-Signal Supervisor	Operating test. As per manufacturers instructions.
31	Brakes, switch machines.	136.8	137.31	1 Month		Signal Maintainer	Log Book		Over-run test. As per manufacturers instructions.
31a	Brakes, all types, switch machines.	136.8	137.31a	2 Years		Signal Insp. & Mn'tr.	968-E-Rev.	Signal Engineer - Signal Supervisor	Operating test. As per manufacturers instructions.
32	Clutches, switch machines.	136.8	137.32	3 Months		Signal Maintainer	Log Book		Slippage test. As per manufacturers instructions.
32a	Clutches, switch machines.		137.32	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer-Signal Supervisor	Slippage test.
33	Service test.		137.33			Sig. Insp. or person in charge		Signal Engineer	Circuit and apparatus test.
34	Spring switch.		137.34	1 Week		Signal Maintainer	Log Book		Block test.
34a	Spring switch.		137.34a	1 Year		Signal Inspector	F-102	Signal Engineer-Signal Supervisor	Compression test.
35	Traffic Control Systems.		137.35	2 Years		Signal Inspector	F-100 shs. 1&2	Signal Engineer -Signal Supervisor	Type K, Class M.
35a	Traffic Control, all systems.	136.476	137.35a			Signal Maintainer		Ass't. Eng'r. Sigs.-Signal Sup'r.	Interlocking tests.
36	Switch Repeater Relay Test.		137.36	4 Years		Signal Inspector	F-103	Signal Engineer	Irregularities to be corrected at once.
36a	Switch Repeater Relay Test.		137.36			Signal Maintainer	Log Book		When Switch Circuit Controller or Switch Machine is installed or replaced.

NOTES:

1-Signal Supervisor and Inspector will examine and sign Log Book at least annually.

2-Test or inspect at more frequent intervals if required by local conditions.

3-Signal Inspectors will report all appliances or conditions to be corrected on Form 922-E with copy to Signal Engineer, Assistant Engineer Signals, Division Engineer, and when required, to Signal Maintainer. If correction is made at time of inspection report will so indicate. If correction is to be made later, Assistant Engineer Signals will follow the condition to a prompt conclusion. When correction has been made he will so indicate on his copy of Form 922-E, which will then be forwarded to Signal Engineer.

4-When recording results on forms provided for a specific test indicate whether adjustment was required at time of test or inspection.

5-Matters pertaining to tests and inspections that are referred to Assistant Engineer Signals on the three principal regions will be handled on the B.&O.C.T. and Staten Island by the respective Signal Supervisor.

6-B.&O. Rules shall be followed when more restrictive than I.C.C. Rules.

7-Assistant Engineer Signals will discuss frequently with Supervisors and Maintainers those tests and inspections for which they are responsible and satisfy himself that the Instructions are understood and are being carried out.

8-Log Book to be Form 2016.

9-Signal Supervisor should accompany Signal Maintainer once annually during quarterly tests Numbers 8-8b-9-19-23-25 and 26.

10-Additional general rules see 137.50 to 137.72 inclusive.

Approved: ____________
Chief Eng'r. Maintenance

Approved: ____________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS AND INSPECTIONS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
March 14, 1951

Revised 3-14-51

Test No.	Test or Inspection	Rules & Instructions		Max. Time between Tests or Inspections	Inspection to be made by	Test to be made by	Recorded on Form No.	Disposition of Form	Remarks
		I.C.C.No.	B.&O.No.						
1	Grounds.	136.2	137.1	1 Year		Signal Inspector	F-105	Signal Engineer-Signal Supervisor	Test all line and operating batteries.
1a	Grounds.	136.2	137.1	3 Months		Signal Maintainer	Log Book		Test all line and operating batteries. Circuits that cannot be cleared at once to be reported.
1b	Grounds.	136.2	137.1	1 Month		Signal Maintainer	Log Book		Line and operating batteries at Interlockings.
2	Track circuit shunting sensitivity and adjustment.	136.56	I-101 and 137.2	1 Year		Signal Inspector and Signal Maintainer.	921-H	Signal Engineer-Signal Supervisor	
3	Track circuits, Note 2.		137.3	2 Months	Signal Maintainer		Log Book		Visual inspection
3a	Track circuits.		I-101 and 137.3a	When necessary		Signal Insp.& Mn'tr.	921-H	Signal Engineer-Signal Supervisor	Foreign current test.
3b	Track circuits.		I-101 and 137.3b	When required		Signal Insp.& Sup'r.	921-G-Spl.	Signal Engineer	D.C. track circuit test record.
4	Batteries-Storage, Note 2.		I-111, I-112 & 137.4	1 Month		Signal Maintainer	922-H-Spl.	Signal Supervisor	Visual inspection and voltage test.
4a	Batteries-Capacity test.		137.4a	1 Year		Signal Inspector	922-H-Spl.	Signal Engineer-Signal Supervisor	Lead plate battery. (Report to Signal Engineer on Form F-105).
4b	Batteries-Primary, Note 2.		I-113, I-139 & 137.4a	1 Month		Signal Maintainer	920-A	Signal Supervisor	Visual inspection and voltage test
5	Arrester grounds.	136.78	I-117 and 137.5	2 Years		Signal Insp.& Mn'tr.	912-E-Rev.	Signal Engineer-Signal Supervisor	Ground "Megger" test.
6	General inspection.		137.6	4 Years	Signal Insp. & Mn'tr.		F-103	Signal Engineer	Report general conditions.
6a	General inspection foreign plants.		137.6a	4 Years	Signal Supervisor			Sig. Eng'r. – Ass't. Eng'r. Sigs.	Visual inspection. Report general conditions.
7	Signal mechanisms.	136.102	137.7	2 Years		Signal Inspector	968-C	Signal Engineer-Signal Supervisor	Torque and operating test.
7a	Signal mechanisms, Note 2.	136.102	137.7a	1 Month	Signal Maintainer		912	Signal Supervisor	Clean, oil and adjust.
8	Switch circuit controllers.	136.103	137.8	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	Clean, lubricate and test.
8a	Switch circuit controllers, Note 2.	136.103	137.8	1 Month	Signal Maintainer		Log Book		Check adjustment.
8b	Point detectors.	136.334	137.8a	3 Months		Signal Maintainer	968-D-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Clean and test.
9	Fouling circuits.	136.104	137.9	3 Months		Signal Maintainer	968-D-Rev.	Signal Supervisor	Test and inspect.
10	Insulated joints.	136.59	137.10	1 Month	Signal Maintainer		Log Book		Inspection.
11	Relays, D.C.	136.106	I-105, I-106 & 137.11	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer – Signal Supervisor	Operating test.
11a	Electric locks.	136.105	I-109 and 137.11a	2 Years		Signal Inspector	968-E-Rev.	Signal Engineer – Signal Supervisor	Operating test, include forced drop type.
11b	D.C. apparatus, replacement.	136.109	137.11b		Signal Maintainer	Signal Inspector	921-E	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
12	Relays, A.C.	136.106	137.12	2 Years		Signal Inspector	968-F	Signal Engineer-Signal Supervisor	Operating test.
12a	A.C. apparatus, replacement.	136.109	137.12a		Signal Maintainer	Signal Inspector	921-F	Signal Supervisor	Signal Supervisor will send original copy to Signal Inspector.
13	Arresters (Gas type).	136.107	137.13	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	Voltage breakdown test.
13a	Arresters (Other types).		137.13a	1 Year		Signal Inspector	912-E-Rev.	Signal Engineer - Signal Supervisor	"Megger" test.
13b	Arresters (all types).		137.13b	After each storm	Signal Maintainer		Log Book		Inspection
14	Insulation test.	136.108	I-127 and 137.14	5 Years		Signal Insp.& Mn'tr.	968-G-Rev.	Signal Engineer - Signal Supervisor	Test all signals, wires and cables including power.
15	Signal pole line.		137.15	2 Years	Signal Inspector		F-105	Signal Engineer	Inspection.
16	Mechanical locking.	136.376	I-110 & 137.16	2 Years		Signal Insp.& Mn'tr.	F-103	Signal Engineer – Signal Supervisor	Test after any locking change is made.
17	Approach locking.	136.377	137.17	1 Year		Signal Sup'r.& Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	Check and test.
18	Time locking.	136.378	137.18	1 Year		Signal Sup'r.& Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
19	Route locking.	136.379	137.19	3 Months		Signal Maintainer	968-K-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
20	Indication locking, Signals.	136.380	137.20	1 Year		Signal Sup'r.& Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
20a	Indication locking, Switches.	136.380	137.20a	1 Year		Signal Sup'r.& Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
21	Traffic locking.	136.381	137.21	1 Year		Signal Sup'r.& Mn'tr.	968-H-Rev.	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
22	Switch obstruction test.	136.382	137.22	1 Month		Signal Maintainer	968-Q	Ass't. Eng'r. Sigs.-Signal Sup'r.	" " "
22a	Switch obstruction test.	136.382	137.22	1 Year		Signal Sup'r.& Mn'tr.	968-Q	Ass't. Eng'r. Sigs. Signal Sup'r.	" " "

BALTIMORE & OHIO RAILROAD

SCHEDULE OF SIGNAL DEPARTMENT FIELD TESTS AND INSPECTIONS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 6, 1958

Sheet No.1

I-120-D

(5) Care should be taken to always stand between the handles. This automatically brings the point of the cutting disc to bear against the rail and a rolled chip will be cut. If the operator stands outside the handles and tries to work the cleaner with the arms and not his body, he will find the handles are lowered, the disc will give off a shivered chip, like cast iron, and the edge of the cutting disc will dull quickly. The cutting disc is similar to a machine tool, it will stay sharp and cut properly when held at the correct angle.

c. The Power Grinder.

(1) The Power Grinder is particularly well suited for reconditioning lipped and worn rail. When grinding off rail overflow or lip, it is best to hold the wheel diagonally across the lip for faster cutting and to keep the face of the wheel squared up and prevent grooving.

(2) One fact must be borne in mind when using the power grinder which is that grease must be removed from the rail before grinding. If this is not done, the pores of the wheel will fill with grease and be carried from joint to joint. A freshly ground joint will appear to be clean, bright metal but close examination will show a film of grease unless the wheel is kept clean. If the wheel becomes fouled with grease, it should be cleaned before grinding the next joint. One way to clean the wheel is to carry along a worn out wheel and hold it against the fouled wheel until the grease has been ground off.

2- The Bonding Operation.

a. The Type T-5 Welder.

(1) When the Welder is first received, the operator should place it on the rail to be bonded and clamp it in position. See that the two set screws on the gauge side of the rail head bear equally against the rail. If they do not, adjust these screws until they do, so that the Welder will square itself with the rail. For 131 lb. rail, only the points of these screws should be exposed while for 100 lb. rail about 3/16" of the screws can show between the Tee head of the Rack and the side of the Rail Head. Next, note the position of the crucible-molds. They should stand vertically and their bottoms should be exactly flush with the bottom of the rail head. If they are too low, hot metal from the molds will leak and spoil the bond and welds. If they are too high, the bond will be welded too high on the rail head and will result in wheels from passing traffic striking the welds. There are two 5/16" cap screws in the cross head of the welder frame which bear on the top of the rail which are put there for adjusting the crucible-mold height. These screws should be adjusted until the crucible-molds are just right, that is, their bottoms flush with the bottom of the rail head. The same number of threads should be exposed on both screws to insure that the welder sets level.

(2) When the Welder is new, it will be found that the crucible-molds will stand vertically but after some use, the compression springs will take a set from being heated and it will be necessary to run up the 3/8" hex nuts on the studs to put more pressure on these springs which in turn will hold the crucible-molds in their proper position.

(3) Having made the adjustments of the Type T-5 Welder, proceed as follows: A tool tray and necessary tools are provided with the welder. Place an opened box of powder in the tool tray and transfer the metal discs from the envelope to the round metal box. Open the cardboard box containing bonds, placing both in the tray alongside the powder. Then set the tool tray across the two ties to the right of the joint where it is in easy reach.

(4) Grasp the T-5 Welder by the wood handle with the left hand and keep it in the left hand until it is clamped on the rail. With the right hand, insert a bond in the clevis clips. To do this neatly, grasp the bond in the center of the loop with the right hand, thumb on top, index and second fingers under the bond strand. Lay the bond strand in the clevis clips, holding the bond horizontally, then with a slight wrist motion, twist the bond downward and it will lie in the clips and grooves of the crucible-molds and not fall out. Keeping the Welder in the left hand, place it with the clamping rack directly over the center of the joint and lower until the two screws on the cross-head bear on top the rail. With the right hand, push the handle of the pinion forward until the crucible-molds bear snugly against the rail head. Then move the thumb of the left hand forward and press down on the trigger or dog which will engage the rack and hold the welder securely clamped to the rail. Check to see that the crucible-molds are flush with the bottom of the rail head.

(5) Now place one (never more than one) metal disc in the crucible portion of each crucible-mold, seeing that it completely covers the hole in the bottom of the crucible. Then reach for the powder, take off the red cap of one cartridge and dump (don't pour) the cartridge, case and all, on top the metal disc in one crucible and leave it. Then reach for the second cartridge and do likewise. Now take the Flint Gun in the right hand and using it as a hammer, hold up first one cartridge case and then the other, clear of the coarse powder, and tap the blue end of the case until all the find powder falls out on top the coarse powder.

(6) Close the covers over the molds and, using the flint gun as a pistol, reach to the front of the molds and fire a spark under the cover and into the powdered metals whereupon ignition and reaction will take place instantly. Immediately upon shooting the spark, snatch the flint gun away quickly to prevent its barrel from becoming corroded by the fumes from the reacting powder which will gum its ratchet and ruin it. Take care to keep the face and hands well away from the Welder when it is firing because the metal being generated is very hot and uncomfortable burns might result. There is no explosion and no danger if common precaution is exercised, but treat it with respect.

(7) Immediately after the heat reaction has taken place, place the flint gun in the tool tray (same place each time) and pick up the screw driver. It will be noted there is a deposit of dross or slag left in the crucibles. With the bit of the screw driver, open up the crucibles and clean out this slag, all of it, and also scrape off any deposits on the molds around the crucible hole. This prevents slag from the next charge cementing to this deposit thus making it easier to remove all the slag. Close the crucible-molds but leave the covers open for the next charge.

(8) Now, again grasp the Welder handle with the left hand, keeping the thumb off the trigger, and with the right hand, push forward on the pinion handle. The trigger will release the rack and clamp from the rail automatically. Then before raising the Welder, with the left hand pull the Welder straight back. This will unhook the bond just

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 9, 1948

applied from the holding clips and the Welder is freed to be raised off the rail without rubbing the crucible-molds against the deposited weld metal, thus aiding their preservation.

(9) Study these movements carefully to see that the various operations are done in the sequence prescribed above. Forming a habit of doing them this way automatically results in doing the work smoothly and fast. Don't switch hands on the Welder, keep it in the left hand to prevent awkward movements.

b. Fit of Crucible-mold to Rail.

(1) Copper in the molten stage is very liquid and therefore will escape through almost any crevice large enouth to admit light. The lower, or mold portion of the crucible-mold is that in which the bond terminal is clamped and where the fusion of bond terminal and rail takes place. In order for this weld to properly occur, it is necessary that all the hot molten metal be withheld in this area. The escape of any part of this hot metal will effect the proper fusion of bond terminal to rail. Naturally, the point of first escape is at the bottom of the mold and it is essential that there be a line of full contact between the bottom of the mold and the rail. In other words, there should be no light showing at any point the full width of the molds. On new rail, being bonded the first time, there is little danger of this taking place, providing all the shavings from the rail cleaner have been brushed away. But on old rail that has been battered there may be a faulty fit, mold to rail. In such event, open the crucible above and look down into the bottom of the mold. If "daylight" shows between mold and rail, re-dress the rail until a perfect fit is obtained. If this cannot be done without a great deal of labor, then cork the bottom edge of the mold. Use a screw driver and a fire clay cement or equivalent for this purpose, provided none of the corking material extends over and into the mold cavity.

c. Deposited Weld Metal.

(1) It will be found that the deposited weld metal is generally solid, dense metal when bonds are being installed out of face on thoroughly cleaned, dry steel. The operator following a rail re-lay, bonding the joints as fast as the rail is being laid, will work his type T-5 Welder sufficiently rapid for the crucible-molds to get well heated. The deposited weld metal is always of a better grade when the crucible-molds are thoroughly heated; the hotter the better.

(2) When the deposited weld metal is found to be porous, indicated by a hollow pipe projecting above the weld, there is some local condition causing it. Either the crucible-molds are cold or there is some substance on the rail that is being converted into gas when the hot metal strikes the rail. Grease or moisture will be changed into gas by the superheated metal and cause blow holes to be present in the weld metal. Some porosity is not particularly objectionable but if there is enough gas present to make the weld metal like a honey comb, there is danger that the ends of the bond wires will not be fused. Without this fusion the bond, of course, is not welded into the track circuit. Also the mechanical strength of honey comb metal is not as great as in solid, dense metal and the ability of the welds to resist traffic damage is correspondingly decreased.

d. Trimming the Welds.

(1) After the Welder has been removed from the rail, it will be noticed that there is a slight excess of metal above the line of the mold. The amount of this metal is variable. When bonding straight away, out of face, the crucible-molds become well heated and the welds shrink down to solid metal, leaving only a small shelf of excess metal. However, all welds should be trimmed by placing a cold chisel horizontally, bit parallel to the rail, in the line marked by the upper portion of the mold, and cutting through to the rail. Chisel should be kept sharp and should be protected by not allowing it to cut into the steel. Make the last blow a light one because if the chisel strikes the hard steel the edge will be dulled.

(2) Trimming the welds involves some work but is advocated for the following reasons. First, the drag of the chisel through the weld metal exerts a force that will cause the weld metal to move if any error exists. The rail may not have been properly cleaned or the welder may not have been spotted over the cleaned rail, resulting in a poor weld and a bond to cause a red signal at some future time with all the inconvenience and expense involved by such. Trimming will in many cases disclose a poor weld and the time to find it is when the rail is first being bonded. Second, removing the excess metal also removes the shelf or lump against which dragging equipment can strike a damaging blow. A properly trimmed weld is a streamlined weld and will throw off an otherwise damaging blow. Third, trimming the welds removes the shelf on which guide rollers of adzing machines, rail cranes and other double flanged equipment will ride. Generally, such equipment can move over bonds that have been trimmed without damage to the bonds.

3- Crucible Molds.

a. The crucible-molds are made from graphite. As the name indicates, the graphite is shaped to provide two functions, as a container in which to react the powdered metals and so produce the molten copper alloy in the upper or crucible portion and then to lead the hot metal into the mold area where it strikes and fuses the rail and bond terminal together. A hole is provided in the bottom of the crucible to connect it with the mold portion. The first procedure prior to a weld is to cover this tap hole with a thin metal disc which serves to retain the powdered metal. When the metal reacts, the heat so generated will instantly melt the metal disc and having done so, the superheated metal plunges through the tap hole, against the rail and bond terminal fixed in the mold area and the weld is accomplished.

b. It will be noted that the graphite crucible-molds are machined to a certain pattern. The size of the mold cavity, the shape of the duct or channel leading from the tap hole of the crucible are all worked out to a proper balance to secure the right results. There should be no attempt on the part of field force to alter these crucible-molds in any manner because to do so will result in throwing the welding operation out of balance.

c. Since these crucible-molds are made from graphite, a comparatively brittle material, they will wear out after a time. Constant heating and cooling causes erosion and repeated clamping against the rail causes the surfaces in contact with the rail to wear from abrasion. On new rail, abrasion can be reduced by care on the operator's part to adjust his type T-5

Welder so that when clamped on the rail, the crucible-molds are always in their proper position, making it unnecessary to tap them up or down. Any movement against the rail after clamping tends to abrade the graphite surfaces so the operator after a little experience learns to set his welder in the proper position each time. Abrasion of the bottom edge of the mold cavity is hastened if the operator does not take his welder off the rail in the right way after the bond is applied. He should pull the welder directly back to him, loosening same from the applied bond and freeing the mold from the weld metal. This metal is quite abrasive and if the operator raises his welder before clearing the applied bond, he will grind the lower edge of the mold against this weld metal and so wear away the vital part of the mold surface.

d. Experience indicates that when bonding new rail only, one pair of crucible-molds will put on 500 bonds as an average.

e. Field forces must not attempt to extend the crucible-mold life by redressing the rail contact surfaces. This procedure is not recommended because it affects the area of the mold cavity and throws the entire operation out of proper balance. When the crucible-molds reach their life limit, as is indicated by leakage of hot metal at the bottom of the mold cavity, they should be replaced with new ones.

4- Powdered Attaching Metal.

a. There are about a dozen different metals which go to make up a complete charge for a weld, the principal ones being aluminum and copper oxide.

b. These metals are put together in a cartridge for handy use and consist of two grades of fineness. In the bottom or blue end of the cartridge is a very fine gray powder which is called the "starting powder". Upon dumping the cartridge into the crucible-mold the coarse powder is dumped first, then the fine starting powder follows and lies on top the coarse powder. The latter will not ignite readily but the starting powder will catch up a spark from a flint gun and its ignition will supply sufficient heat to cause the coarse powder to react. During this reaction the aluminum combines with the oxygen in the copper oxide and having taken this oxygen, superheated copper is precipitated which plunges against the bond terminal and rail, fusing them together. The slag or dross remaining in the crucible is principally aluminum oxide.

c. Experience has taught that in a period of about nine months from date of shipment, the fine starting powder in the bottom of the cartridge has a tendency to cake. The degree of "caking" seems to vary with the atmospheric conditions under which it is stored. By sharply rapping the bottom of the cartridge case, this starting powder can be forced out whereupon it will fall in flakes or lumps. It is stubborn about igniting when lumpy. In such a case, the operator will use the bit of his screw driver to break up these lumps and repulverize before dumping out of the cartridge, whereupon the powder will ignite readily and a normal reaction will take place.

d. It is better to use the powdered metals before they have time for this caking to occur. Therefore, signal maintainers shall not carry more powder in their tool houses than they know they will use in the next 90 days. Under no circumstances shall any of the coarse powder be poured out in order to avoid trimming the weld, or for any other reasons.

5- Ratchet Type Clamps.

a. These clamps are provided for suspending any single crucible-mold for bonding to the rail head. At switch points and frog wing rails, the rail heads are sometimes too close together to enable the use of the T-5 Welder. In such instances, the joints can be bonded by using these Ratchet Clamps, suspending a left hand mold in one and a right hand mold in the other. Making the welds requires the same procedure as followed with the T-5 Welder, once the bond is clamped on the rail.

b. The Ratchet Clamp can also be used for installing jumper bonds whose terminals are to be welded on the rail heads. In this case crucible-mold Cat. No. 20185 is suspended in the Ratchet Clamp. This crucible-mold has an outlet through its bottom for the bond strand to emerge straight down from the weld. As is done when bonding the joints, clamp this crucible-mold against the rail with its bottom flush with the lower edge of the rail head. Then proceed with the welding operation in the usual manner.

NOTE:- For bonding 140 lb. P.S. rail, paragraph 2-a-7 is modified to the extent that crucible-molds must be removed from rail before cleaning deposit of dross or slag.

APPROVED: Harrison
CHIEF ENG'R. MAINTENANCE

APPROVED: Hunt 6-14-48
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 9, 1948

1- Cleaning the Rail.

a. The Cadweld process of welding is wholly dependent upon clean steel and too much emphasis cannot be placed upon the importance of cleaning the rail. It is impossible to weld metals together if any dirt, grease, mill scale, rust or moisture is present. The Cadweld process requires that all of the surface of the steel rail must be freshly bright, clean metal before the bond can be welded to it. Any spots or streaks of rust, mill scale or foreign matter of any kind will foul the welds. Therefore, it is of the utmost importance that the rail be absolutely clean before the welds are attempted. When applying bonds to the old rail, pitted with rust, more work is required to cut down to the parent steel but it has to be done if successful welds are to be had. If the rail is coated with soft grease, it can be wiped off with rags or waste. If it is stiff and tacky, scrape it off with any tool, putty knife, etc., and scrub the area with a wire brush soaked in gasoline. Then allow the rail to dry a few minutes and follow with power grinder or the Type T-1 Hand Cleaner. Bonds shall not be applied to moist or wet rail.

b. Adjusting the Type T-1 Rail Cleaner.

(1) Upon receipt of this tool, note that a 1/4" pin is taped to the frame which is a duplicate of the pin driven into the frame cross head. Drive the loose pin into the hole provided for it, allowing 1/2" of its length to project, same as the other pin on the opposite side of the pivot stud. These two pins serve to limit the movement of the yoke to its proper arc.

(2) Place the yoke of the cleaner on the rail with the two "fingers" flat on top of the rail head. Loosen both the bolt holding the cutting disc and the 1/2" screw through the yoke on the gauge side of the rail head. Hold the cleaner frame so that the left hand handle is a little less than at right angles to the rail. Set the cutting disc so that one of its ten faces bears fully against the rail, then tighten the cutting disc firmly. Make a trial cut when it likely will be found that the disc is cutting only on the left or the right side of its face. This calls for a fine adjustment and this is accomplished by turning the 1/2" screw on the gauge side of the rail, in or out from the rail. Turn this screw until the disc makes a cut the full width of the disc cutting face, then tighten the jamb nut on the 1/2" screw and the tool will stay in adjustment.

(3) Having adjusted the Type T-1 Cleaner, set it on the rail with the cutting disc directly over the center line of one of the two bolts adjacent the joint. Stand between the handles of the cleaner and let the left leg bear against the left handle. This will exert a pressure and force the cutting disc to bite into the rail. Holding this pressure with left hand and left leg, bear down on the right hand. This will cause the frame crosshead to rotate on its pivot and the cutting disc will make a full cut from bottom to top of the rail head. A little practice will demonstrate that the weight of the body can be thrown on the right handle and a substantial chip can be cut with little effort. Don't pull up with the left hand; shift the weight of the body from the left foot to the right hand, letting head and shoulders go down with the tool right handle.

(4) As suggested, make the first cut over the center line of the bolt, then repeat, letting each cut lap over the preceding one and work toward the end of the rail until a space 1-1/2" wide has been cleaned. Usually 4 to 5 strokes, cutting the full width of the disc and lapped, will provide a space 1-1/2" wide.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 9, 1948

3-17-50 - Revised account T-6 Welder.

are flush with the bottom of the rail head and that there is no crack between mold bottoms and rail.

(5) Now place one (never more than one) metal disc in the crucible portion of each crucible-mold, seeing that it completely covers the hole in the bottom of the crucible. Then reach for the powder, take off the red cap of one cartridge and dump (don't pour) the cartridge, case and all, on top of the metal disc in one crucible and leave it. Then reach for the second cartridge and do likewise. Now take the Flint Gun in the right hand and using it as a hammer, hold up a cartridge case, clear of the coarse powder and tap the blue end of the case until all the fine powder falls out. Then close the mold cover immediately. Then do the same thing with the second cartridge. It is important that the mold covers be closed just as soon as the cartridge cases are dumped, never leave powder uncovered, not even for an instant. If strict attention is paid to this, the mold covers will fully protect the operator and insure against accident.

(6) Having dumped the powder into both molds and closed the covers, using the Flint Gun as a pistol, reach to the side of the mold cover and fire a spark into the powder, whereupon ignition and reaction will take place instantly and the bond will be welded to the rail. Using the mold cover as a shield when firing the spark will prevent the Flint Gun from becoming fouled by the fumes from the hot metal. A further aid to this is to smatch the Gun away as soon as the spark is shot. Take care to keep all parts of the body away from the Welder when it is firing because the metal being generated is very hot and uncomfortable burns might result. There is no explosion and no danger if common precaution is exercised but treat it with respect.

(7) Immediately after the heat reaction has taken place, place the flint gun in the tool tray (same place each time) and pick up the screw driver. It will be noted there is a deposit of dross or slag left in the crucibles. With the bit of the screw driver, open up the crucibles and clean out this slag, all of it, and also scrape off any deposits on the molds around the crucible hole. This prevents slag from the next charge cementing to this deposit, thus making it easier to remove all slag. Close the crucible-molds but leave the covers open for the next charge.

(8) Now again grasp the Welder with the left hand and with the right hand pull the clamp handle up and back as far as it will go. Then pull the Welder straight back, unhooking the welded bond, clear of the welded terminals, then lift straight up off the bond and rail. Don't "roll" the Welder off the rail as this will wedge the mold bottoms against the weld metal and result in broken molds.

(9) Study these movements carefully to see that the various operations are done in the sequence prescribed above. Forming a habit of doing them this way automatically results in doing the work smoothly and fast. Don't switch hands on the Welder, keep it in the left hand to prevent awkward movements.

(10) After removing the Welder, examine the bond strand where it comes out of the terminal. See whether there is any discoloration of the strand, if so, take another turn of the T-shape adjustment screw on the gauge side of the rail, to the left, thus increasing the pressure of the machine against the bond terminals. Continue this adjustment for each bond until the bond strand is bright and free from all heat damage. Then set the jamb nut and no further adjustment will be necessary so long as bonding is done on the same size rail of good condition. If the rail is worn, heads of rail of different width, the pressure cannot be equally applied to both bond terminals and heat discoloration may occur.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
Office of Chief Engineer Communications & Signals
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Feb. 9, 1948

b. Fit of Crucible-mold to Rail.

(1) Copper in the molten stage is very liquid and therefore will escape through almost any crevice large enough to admit light. The lower, or mold portion of the crucible-mold is that in which the bond terminal is clamped and where the fusion of bond terminal and rail takes place. In order for this weld to properly occur, it is necessary that all the hot molten metal be withheld in this area. The escape of any part of this hot metal will effect the proper fusion of bond terminal to rail. Naturally, the point of first escape is at the bottom of the mold and it is essential that there be a line of full contact between the bottom of the mold and the rail. In other words, there should be no light showing at any point the full width of the molds. On new rail, being bonded the first time, there is little danger of this taking place, providing all the shavings from the rail cleaner have been brushed away. But on old rail that has been battered there may be a faulty fit, mold to rail. In such event, open the crucible above and look down into the bottom of the mold. If "daylight" shows between mold and rail, re-dress the rail until a perfect fit is obtained. If this cannot be done without a great deal of labor, then cork the bottom edge of the mold. Use a screw driver and a fire clay cement or equivalent for this purpose, provided none of the corking material extends over and into the mold cavity.

c. Deposited Weld Metal.

(1) It will be found that the deposited weld metal is generally solid, dense metal when bonds are being installed out of face on thoroughly cleaned, dry steel. The operator following a rail re-lay, bonding the joints as fast as the rail is being laid, will work his type T-6 Welder sufficiently rapid for the crucible-molds to get well heated. The deposited weld metal is always of a better grade when the crucible-molds are thoroughly heated; the hotter the better.

(2) When the deposited weld metal is found to be porous, indicated by a hollow pipe projecting above the weld, there is some local condition causing it. Either the crucible-molds are cold or there is some substance on the rail that is being converted into gas when the hot metal strikes the rail. Grease or moisture will be changed into gas by the superheated metal and cause blow holes to be present in the weld metal. Some porosity is not particularly objectionable but if there is enough gas present to make the weld metal like a honey comb, there is danger that the ends of the bond wires will not be fused. Without this fusion the bond, of course, is not welded into the track circuit. Also the mechanical strength of honey comb metal is not as great as in solid, dense metal and the ability of the welds to resist traffic damage is correspondingly decreased.

3- Crucible Molds.

a. The crucible-molds are made from graphite. As the name indicates, the graphite is shaped to provide two functions, as a container in which to react the powdered metals and so produce the molten copper alloy in the upper or crucible portion and then to lead the hot metal into the mold area where it strikes and fuses the rail and bond terminal together. A hole is provided in the bottom of the crucible to connect it with the mold portion. The first procedure prior to a weld is to cover this tap hole with a thin metal disc which serves to retain the powdered metal. When the metal reacts, the heat so

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Feb. 9, 1948

generated will instantly melt the metal disc and having done so, the superheated metal plunges through the tap hole, against the rail and bond terminal fixed in the mold area and the weld is accomplished.

b. It will be noted that the graphite crucible-molds are machined to a certain pattern. The size of the mold cavity, the shape of the duct or channel leading from the tap hole of the crucible are all worked out to a proper balance to secure the right results. There should be no attempt on the part of field force to alter these crucible-molds in any manner because to do so will result in throwing the welding operation out of balance.

c. Since these crucible-molds are made from graphite, a comparatively brittle material, they will wear out after a time. Constant heating and cooling causes erosion and repeated clamping against the rail causes the surfaces in contact with the rail to wear from abrasion. On new rail, abrasion can be reduced by care on the operator's part to adjust his type T-6 Welder so that when clamped on the rail, the crucible-molds are always in their proper position, making it unnecessary to tap them up or down. Any movement against the rail after clamping tends to abrade the graphite surfaces so the operator after a little experience learns to set his welder in the proper position each time. Abrasion of the bottom edge of the mold cavity is hastened if the operator does not take his welder off the rail in the right way after the bond is applied. He should pull the welder directly back to him, loosening same from the applied bond and freeing the mold from the weld metal. This metal is quite abrasive and if the operator raises his welder before clearing the applied bond, he will grind the lower edge of the mold against this weld metal and so wear away the vital part of the mold surface.

d. Field forces must not attempt to extend the crucible-mold life by redressing the rail contact surfaces. This procedure is not recommended because it affects the area of the mold cavity and throws the entire operation out of proper balance. When the crucible-molds reach their life limit, as is indicated by leakage of hot metal at the bottom of the mold cavity, they should be replaced with new ones.

4- Powdered Attaching Metal.

a. There are about a dozen different metals which go to make up a complete charge for a weld, the principal ones being aluminum and copper oxide.

b. These metals are put together in a cartridge for handy use and consist of two grades of fineness. In the bottom or blue end of the cartridge is a very fine gray powder which is called the "starting powder". Upon dumping the cartridge into the crucible-mold the coarse powder is dumped first, then the fine starting powder follows and lies on top the coarse powder. The latter will not ignite readily but the starting powder will catch up a spark from a flint gun and its ignition will supply sufficient heat to cause the coarse powder to react. During this reaction the aluminum combines with the oxygen in the copper oxide and having taken this oxygen, super-heated copper is precipitated which plunges against the bond terminal and rail, fusing them together. The slag or dross remaining in the crucible is principally aluminum oxide.

c. Experience has taught that in a period of about nine months from date of shipment, the fine starting powder in the bottom of the cartridge has a tendency to cake. The degree of "caking" seems to vary with the atmospheric conditions under which it is stored. By sharply rapping the bottom of the cartridge case, this starting powder can be forced out whereupon it will fall in flakes or lumps. It is stubborn about igniting when lumpy. In such a case, the operator will use the bit of his screw driver to break up these lumps and repulverize before dumping out of the cartridge, whereupon the powder will ignite readily and a normal reaction will take place.

d. It is better to use the powdered metals before they have time for this caking to occur. Therefore, signal maintainers shall not carry more powder in their tool houses than they know they will use in the next 90 days. Under no circumstances shall any of the coarse powder be poured out in order to avoid trimming the weld, or for any other reasons.

5- Ratchet Type Clamps.

a. These clamps are provided for suspending any single crucible-mold for bonding to the rail head. At switch points and frog wing rails, the rail heads are sometimes too close together to enable the use of the T-6 Welder. In such instances, the joints can be bonded by using these Ratchet Clamps, suspending a left hand mold in one and a right hand mold in the other. Making the welds requires the same procedure as followed with the T-6 Welder, once the bond is clamped on the rail.

b. The Ratchet Clamp can also be used for installing jumper bonds whose terminals are to be welded on the rail heads. In this case crucible-mold Cat. No. 20185 is suspended in the Ratchet Clamp. This crucible-mold has an outlet through its bottom for the bond strand to emerge straight down from the weld. As is done when bonding the joints, clamp this crucible-mold against the rail with its bottom flush with the lower edge of the rail head. Then proceed with the welding operation in the usual manner.

NOTE:- For bonding 140 lb. P.S. rail, paragraph 2-a-7 is modified to the extent that crucible-molds must be removed from rail before cleaning deposit of dross or slag.

Approved: C B Harvey
Chief Eng'r. Maintenance

Approved: A A Hunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR INSTALLING
CADWELD SIGNAL BONDS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Feb. 9, 1948

1. Signal Inspectors report to and receive instructions from the Signal Engineer through the Chief Signal Inspector.

2. They shall be on the alert to observe and make report of any device functioning improperly, missing, or any other condition that might defeat the purpose for which such signal system or installation was installed. Any improper or unusual condition found will be promptly reported to Signal Engineer, Assistant Engineer Signals and Division Engineer on Form 922-E-Spl.

3. They shall acquaint themselves with the overall purpose of all signaling systems or installations on their respective territories.

4. They shall familiarize themselves with instructions and Standard Plans.

5. They shall make tests, inspections and file reports as prescribed by instructions I-120. Reports shall be mailed promptly, one copy of each report to be retained for future reference.

6. They will mail to Signal Engineer, Assistant Engineer Signals, and Division Engineer on or before Friday noon of each week their expected whereabouts and tests or inspections they will make each day of the following week. If it becomes necessary to change their schedule or whereabouts, they will notify the same officers by wire.

7. They shall cooperate fully with division supervisory and maintenance forces and will render assistance during emergencies.

8. In case of train accident, where signals may be involved, they shall go to that point immediately and make tests to determine if the signal system is functioning correctly. A report of such tests shall be submitted to officers designated in Paragraph 2.

9. They shall make special inspections and reports and perform other duties when instructed.

   (a) Major Changes.

   When interlocking plants are placed in service or extensive changes in type of signals or circuits are made, Inspector will make the prescribed tests and inspections before or immediately after apparatus is placed in service. Under no circumstances shall apparatus be placed in service following major installations or changes before having received thorough operating tests by Inspector and Signal Supervisor.

   (b) Minor Changes.

   When changing the type of an individual signal or making minor mechanical locking or circuit changes, the prescribed tests and inspections will be made as soon as possible after the changes have been completed.

10. Inspector will number each type of form consecutively during the calendar year.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

GENERAL INSTRUCTIONS FOR SIGNAL INSPECTORS

Office of Signal Engineer
Baltimore, Md.
July 21, 1958.

Issued - July 21, 1957
Retyped - July 21, 1958

1- General

a. Applicable standard plans of the 500 series form a part of these instructions.

b. The type of cable normally used for aerial construction shall be in accordance with B.&O. Specifications C-14-17 or C-14-17a.

c. In situations where the braid covering of the cable is liable to be damaged by the exhausts of locomotives, cover cable with split rubber hose.

2- Maximum Length of Spans

a. The construction specified in these instructions is generally applicable to spans used on W.U. pole line. Where spans in excess of this are required, the construction to be employed shall be obtained from the Chief Engineer of Communications and Signals.

3- Suspension Strand

a. All aerial cable carried on pole lines shall be supported by strand referred to herein as strand or suspension strand. Copperweld steel strand shall normally be used. In lieu of Copperweld strand, standard galvanized steel strand may be used, however, it should not be installed where corrosive conditions are known to exist.

b. The size of suspension strand normally required to support cable shall be 3/8 inches. Two cables may be supported on one suspension strand provided the combined weight does not exceed four pounds per linear foot.

4- Point of Attachment of Suspension Strand to Poles

a. Where a line is to carry aerial cable only, the suspension strand shall be attached not less than twelve inches below the top of pole. If a second suspension strand is to be carried on the same pole line, it should be attached in a similar position on the opposite side of the pole. Two cables, when required, may be attached to one suspension strand, using two sizes of cable rings.

b. Cables shall normally be installed below the lowest crossarm.

c. Where a single cable is carried below the open wires, it should normally be attached approximately 1-1/2 feet below the lowest crossarm. This distance may be reduced to four inches, if necessary, to provide suitable ground clearance for the cable.

5- Attachment of Suspension Strand to Poles

a. Suspension strand shall be attached to the poles by means of standard crossarm bolts and suspension clamps. Normally single-ended crossarm bolts should be used but where two cables are to be installed at the same level and on opposite sides of pole, double-ended bolts should be employed. Where cables 1-1/2 inches or more in diameter are to be carried, an extra nut should be placed upon the crossarm bolt between the suspension clamp and the pole to prevent the cable from bearing against the pole.

b. Where suspension strand is carried on the inside of a corner, reinforcing links shall be used when the "pull" on the corner exceeds 15 feet. Reinforcing links should be installed before the strand is pulled to its final tension.

c. Where strands are carried on bridges or other metal structures, the strand attachment should be insulated from the metal members of the structure. This can generally be accomplished by employing an insulating clamp or by attaching the strand to a wood block which is secured to the structure. Where permission cannot be obtained for drilling holes in the structure, it will usually be necessary to secure the wood block to the structure by some form of clamp.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

5- Attachment of Suspension Strand to Poles (contd.)

Suspension strands should not be attached to the top members of bridges over the tracks where they would be exposed to the direct **exhausts** of locomotives.

6- Attachment of Suspension Strand to Walls

a. Strands carried along building walls, retaining walls, or bridge abutments should normally be supported by galvanized steel pole brackets equipped with one bolt messenger clamp. On uneven walls, it may be necessary to employ special fixtures to provide greater clearance. Wall attachments should be spaced from thirty to forty feet apart.

7- Dead-Ending Suspension Strand

a. Suspension strand should be dead-ended:

(1) At poles where the size of the suspension strand changes and the strand on the two sides of the pole are to be strung with materially different tensions.

(2) At corners having a "pull" of forty feet or more.

(3) At other points in a line where the installation would be simplified.

8- Running Out Suspension Strand

a. In running out strands along the ground or over bolts, care should be taken not to injure the strand. Where the strand is to cross over trolley or supply wires, a dry rope fitted with rings should first be erected over such wires and the strand then run through these rings. This method should also be used in running strand over highways or streets where the sag of the strand without support would be sufficient to be hazardous.

9- Suspension Strand Tensions

a. Strand shall be strung to the tension prescribed in Table I.

Table I

Stringing Tensions for Suspension Strand Prior to Attaching Ca

Stringing Temperature	Span Length	
	115 Ft. or Less	More than 115 Ft.
0° F	1400 lbs.	1450 lbs.
20° F	1200 "	1250 "
40° F	1000 "	1050 "
60° F	800 "	850 "
80° F	650 "	700 "
100° F	500 "	600 "
120° F	400 "	500 "

10- Pulling Suspension Strand

a. In general, it is not practicable to "pull" more than 1/2 mile of strand in a comparatively straight section with each set up of pulling tackle. Sections in a line containing numerous corners should be shortened.

b. The procedure outlined below is intended to furnish a practicable method to follow in stringing strand by tension where a strand dynamometer is used.

(1) Take the air temperature on a pole in an exposed location at the time the strand is to be pulled.

(2) Determine the tension values from Table I for the strand at the observed temperature.

(3) Determine the dynamometer dial readings from the calibration chart with the instrument corresponding to the stringing tensions obtained from Table I.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV, 2, 1947

10- Pulling Suspension Strand (contd.)

b. (4) Pull the strand until proper dial readings are obtained on the dynamometer at the various test points indicated on plan. In checking the tension at the various test points, take three readings with the dynamometer, moving the dynamometer along the strand about three inches between readings and use the average value. When the dial reading is lower than desired, the strand should be slowly repulled. If the dial reading is above that desired, the strand should be slacked off below the correct value and then repulled.

c. Where the strand is pulled in a comparatively straight section, the suspension clamps should be tightened at each test point after the proper tension has been obtained. In a section containing corners or grades, it will often be found that the tension is higher on the pulling side. In this case, the suspension clamps should be tightened when the proper tension is secured on the low side and the strand slacked off on the high side. However, if the difference is only one or two points on the dial, the whole section may be left to equalize and the clamps tightened the next day. Oiling the grooves of the suspension clamps at corners will make the "pull" easier and reduce the difference in tension at either side of corners.

11- Method of Suspending Cable from Suspension Strand

a. Aerial cables shall normally be suspended from strands by means of approved types of metal rings. In general, the material used in the cable rings should be the same as that in the suspension strand or of such type as to not result in corrosion. Other methods of supporting the cable may be used when approved by the Chief Engineer of Communications and Signals.

b. To prevent ring cutting, saddles should be installed in the first two rings on each side of all poles.

c. Where lead or braid covered cables are carried on bridges, it will usually be advisable to use saddles in all cable rings to protect the cable against injury.

12- Size and Spacing of Cable Rings

a. The size and spacing of cable rings which should normally be employed for various sizes of cables are specified in Table 2.

Table 2

Diameter of Cable (inches)	Diameter of Rings (inches)	Spacing of Rings (inches)
1/2 to 1	1-1/2	15
1-1/16 to 1-3/8	2	15
1-7/16 to 1-11/16	2-1/2	15
1-3/4 to 2-5/16	3	15

13- Installing Braid Covered Cable

a. Braid covered cable should normally be pulled through cable pulleys installed at intervals of approximately fifteen feet and then attached to the strand by means of cable rings. However, where the length of cable is short, it may be pulled directly through the rings.

14- Anchoring Cable to Suspension Strand

a. On grades where the difference in elevation of adjacent suspension strand attachments is between ten per cent and fifteen per cent of the span length, the cable should be anchored to the strand adjacent to the top pole and at every fifth pole on the grade. Where the grade is greater than that specified above, the cable should be anchored at every third pole.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

14- Anchoring Cable to Suspension Strand (contd.)

In all cases, the anchor should be installed approximately two feet from the pole on the downgrade side.

b. At points in a line where a cable is carried around the outside of a corner pole on which the pull exceeds twenty feet, the cable shall be anchored to the strand, each side of the pole at a point two to three feet from the pole. The anchors shall be installed before the blocking between the cable and the pole is removed.

c. Where a cable leaves the suspension strand at a terminal, it shall be permanently anchored to the strand immediately after installation. The anchor should normally be installed three to four feet from the point where cable drops to terminal or relay case.

d. At railroad crossings, cables 1-1/2 inches in diameter or larger should be anchored to the strand at each crossing pole. The anchor should be installed approximately two feet from each crossing pole on the field side.

e. Grade clamps or other approved devices should be used for anchoring cables to strands.

15- Protection of Cable

a. Where a cable is carried over a trolley contact conductor, and a sufficient separation cannot be provided to preclude the possibility of a trolley pole coming into contact with the cable or strand, a cable guard must be provided above trolley wire.

16- Inspection of Cable During Installation

a. Cable should be carefully watched during the installation in order that any defects in or any damage to the braid covering may be detected and repaired. If there appears to be any possibility of the cable absorbing moisture from any defect, it shall be repaired immediately.

17- Grounding Suspension Strand

a. Suspension strand shall be grounded by tying to ground connections at signal locations and cut sections.

APPROVED: ______________________
CHIEF ENG'R. MAINTENANCE

APPROVED: ______________________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

1- General

a. Applicable standard plans of the 500 series form a part of these instructions.

b. The type of cable normally used for aerial construction shall be in accordance with B.&O. Specifications C-14-17 or C-14-17a.

c. In situations where the braid covering of the cable is liable to be damaged by the exhausts of locomotives, cover cable with split rubber hose.

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a. The construction specified in these instructions is generally applicable to spans used on W.U. pole line. Where spans in excess of this are required, the construction to be employed shall be obtained from the Chief Engineer of Communications and Signals.

3- Suspension Strand

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b. The size of suspension strand normally required to support cable shall be 3/8 inches. Two cables may be supported on one suspension strand provided the combined weight does not exceed four pounds per linear foot.

4- Point of Attachment of Suspension Strand to Poles

a. Where a line is to carry aerial cable only, the suspension strand shall be attached not less than twelve inches below the top of pole. If a second suspension strand is to be carried on the same pole line, it should be attached in a similar position on the opposite side of the pole. Two cables, when required, may be attached to one suspension strand, using two sizes of cable rings.

b. Cables shall normally be installed below the lowest crossarm.

4-5-50 : Paragraph is revised.

c. Where a single cable is carried below the open wires, it should normally be attached approximately 1-1/2 feet below the lowest crossarm. This distance may be reduced to four inches, if necessary, to provide suitable ground clearance for the cable.

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a. Suspension strand shall be attached to the poles by means of standard crossarm bolts and suspension clamps. Normally single-ended crossarm bolts should be used but where two cables are to be installed at the same level and on opposite sides of pole, double-ended bolts should be employed. Where cables 1-1/2 inches or more in diameter are to be carried, an extra nut should be placed upon the crossarm bolt between the suspension clamp and the pole to prevent the cable from bearing against the pole.

b. Where suspension strand is carried on the inside of a corner, reinforcing links shall be used when the "pull" on the corner exceeds 15 feet. Reinforcing links should be installed before the strand is pulled to its final tension.

c. Where strands are carried on bridges or other metal structures, the strand attachment should be insulated from the metal members of the structure. This can generally be accomplished by employing an insulating clamp or by attaching the strand to a wood block which is secured to the structure. Where permission cannot be obtained for drilling holes in the structure, it will usually be necessary to secure the wood block to the structure by some form of clamp.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

5- Attachment of Suspension Strand to Poles (contd.)

Suspension strands should not be attached to the top members of bridges over the tracks where they would be exposed to the direct exhausts of locomotives.

6- Attachment of Suspension Strand to Walls

a. Strands carried along building walls, retaining walls, or bridge abutments should normally be supported by galvanized steel pole brackets equipped with one bolt messenger clamp. On uneven walls, it may be necessary to employ special fixtures to provide greater clearance. Wall attachments should be spaced from thirty to forty feet apart.

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(3) At other points in a line where the installation would be simplified.

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a. In running out strands along the ground or over bolts, care should be taken not to injure the strand. Where the strand is to cross over trolley or supply wires, a dry rope fitted with rings should first be erected over such wires and the strand then run through these rings. This method should also be used in running strand over highways or streets where the sag of the strand without support would be sufficient to be hazardous.

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a. Strand shall be strung to the tension prescribed in Table I.

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10- Pulling Suspension Strand

a. In general, it is not practicable to "pull" more than 1/2 mile of strand in a comparatively straight section with each set up of pulling tackle. Sections in a line containing numerous corners should be shortened.

b. The procedure outlined below is intended to furnish a practicable method to follow in stringing strand by tension where a strand dynamometer is used.

(1) Take the air temperature on a pole in an exposed location at the time the strand is to be pulled.

(2) Determine the tension values from Table I for the strand at the observed temperature.

(3) Determine the dynamometer dial readings from the calibration chart with the instrument corresponding to the stringing tensions obtained from Table I.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV, 2, 1947

SHEET NO. 2

10- Pulling Suspension Strand (contd.)

b. (4) Pull the strand until proper dial readings are obtained on the dynamometer at the various test points indicated on plan. In checking the tension at the various test points, take three readings with the dynamometer, moving the dynamometer along the strand about three inches between readings and use the average value. When the dial reading is lower than desired, the strand should be slowly repulled. If the dial reading is above that desired, the strand should be slacked off below the correct value and then repulled.

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b. To prevent ring cutting, saddles should be installed in the first two rings on each side of all poles.

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BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

14- Anchoring Cable to Suspension Strand (contd.)

In all cases, the anchor should be installed approximately two feet from the pole on the downgrade side.

b. At points in a line where a cable is carried around the outside of a corner pole on which the pull exceeds twenty feet, the cable shall be anchored to the strand, each side of the pole at a point two to three feet from the pole. The anchors shall be installed before the blocking between the cable and the pole is removed.

c. Where a cable leaves the suspension strand at a terminal, it shall be permanently anchored to the strand immediately after installation. The anchor should normally be installed three to four feet from the point where cable drops to terminal or relay case.

d. At railroad crossings, cables 1-1/2 inches in diameter or larger should be anchored to the strand at each crossing pole. The anchor should be installed approximately two feet from each crossing pole on the field side.

e. Grade clamps or other approved devices should be used for anchoring cables to strands.

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a. Where a cable is carried over a trolley contact conductor, and a sufficient separation cannot be provided to preclude the possibility of a trolley pole coming into contact with the cable or strand, a cable guard must be provided above trolley wire.

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a. Cable should be carefully watched during the installation in order that any defects in or any damage to the braid covering may be detected and repaired. If there appears to be any possibility of the cable absorbing moisture from any defect, it shall be repaired immediately.

17- Grounding Suspension Strand

a. Suspension strand shall be grounded by tying to ground connections at signal locations and cut sections.

APPROVED: ______________
CHIEF ENG'R. MAINTENANCE

APPROVED: ______________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR SUSPENSION STRAND
AND AERIAL CABLE
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 2, 1947

ITEM NO.	CLASS OF SERVICE	FOR CHARGING		A-C INPUT		D-C OUTPUT				MANUFACTURERS REFERENCE					REMARKS
						VOLTS		AMPERES		G.R.S. CO.			F-M CORP.		
		Lead Cells	Ni-Fe Cells	Volts	Cycles	Min.	Max.	Min.	Max.	Ref.	Plate	Type	Model	Cat. No.	
1	Track	1	2	110	50/60	1.2	3.0	0.25	2.2	B	P1711	B3T-104	DT	1079-D	
2															
3		1	2	5	any	1.2	3.0		2.2	B	P1721	B3X-104	DX	1052-D	
4															
5	(Coded)	1	2	110	60	1.2	3.0	0.5	4.40	C	P1715	B3T-204	DT	1078-D	
6															
7	Signal-Interlocking	4-6	6-9	110	50/60	8.0	13.5	0.16	0.900	A4	P1713	BT-132	DT	1066D	
8															
9	" "	4-6	6-9	20	60	8.0	13.5	0.16	0.900	A4	P1723	BX-132	DX	1042-D	
10															
11	" "	4-6	6-9	110	50/60	8.0	13.5	0.25	1.70	B1	P1715	BT-232	DT	1062-D	
12															
13	" "	4-6	6-9	20	60	8.0	13.5	0.25	1.70	A4	P1725	BX-232	DX	1040-D	
14															
15	" "	4-6	6-9	110	60	8.0	13.5	0.50	2.70	B16	P1717	BT-432	DHX	1096-D	
16															
17	" "	4-6	6-9	20	60	8.0	13.5	0.50	2.70	A5	P1727	BX-432	DX	1038-D	
18															
19	H'wy. X'ing. Sigs.	7-10	10-14	110	60	14.0	22.0	0.35	1.50	B13	P1717	BT-432	DHX	1093-D	
20															
21	" " "	7-12	10-18	110	60	14.0	27.0		2.7				DH	1107-D	Intermittent rating 4.8 amperes.
22	" " "	6	9	110	60/100	Taper Charger							Style J	CST 10196	Emergency rating 5-7 amperes to low battery
23	" " "	6-12	9-18	110	60/100	"	"						Style K	CSU 21045	" " " " " " "
24															
25	Remote Control	10-12	14-20	110	60	20	30	0.16	0.60	B3	P1715	BT-232	DT	1058-D	
26															
27		10-12	14-20	110	60	20	30	0.25	1.20	B10	P1717	BT-432	DHX	1092-D	
28															
29	Interlocking	55-65	80-95	110	60	120	145	0.06	0.75	B	P1745	BP-248	DP	1336	
30															
31	"	55-65	80-95	110	50/100	120	145	0.25	1.50	B5	P1746	BP-448	DP	1240	
32															
33	"	55-65	80-95	110	60	120	145	0.35	2.25	B2	P1747	BP-648	DP	1241	
34															
35	"	55-65	80-95	110	50/60	120	145	0.35	3.0	A2	P1748	BP-848	DP	1242	
36	Special	2	2-4	110	60	3	7	0.25	2.20	B	P1713	B3T-108	DT	1072-D	Explain need on order
37	"	5-10	7-14	110	60	10	20	1.50	10.5	B9	P1747	BP-648	DP	1372	" " " "
38	"	5-10	7-14	110	60	100	220	0.50	4.5	B15	P1745	BP-248	DP	1376	" " " "
39	"	55-65	80-95	110	60	120	145	0.70	6.0	A	P1750	BP-1648	DP	1334	" " " "
40	"	5-10	7-14	110	60	100	22.0	1.0	7.0	B20	P1746	BP-448	DP	1374	" " " "

TYPICAL ORDERING REFERENCE:

RECTIFIER, TYPE B3T-104, INPUT 110 VOLT 60 CYCLE, FOR CHARGING 1 LEAD CELL AT 2.2 AMP. MAXIMUM, REF. B, PLATE 1711, G.R.S.CO. B.& O. PLAN I-126, ITEM 1.

APPROVED: C.A.Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

USAGE TABLE FOR BATTERY CHARGING RECTIFIERS

OFFICE OF CHIEF ENGINEER COMM.& SIGNALS
BALTIMORE, MD.
JULY 7, 1948

I-126

ITEM NO.	CLASS OF SERVICE	FOR CHARGING		A-C INPUT		D-C OUTPUT				MANUFACTURERS REFERENCE							REMARKS
						VOLTS		AMPERES		G.R.S. CO.				F-M CORP.			
		Lead Cells	Ni-Fe Cells	Volts	Cycles	Min.	Max.	Min.	Max.	Fig.	Plate	Type	Form X-41 Item No.	Model	Cat. No.	Form X-41 Item No.	
1	Track	1	2	110	50/60	1.2	3.0	0.25	2.2	B	P1711	B3T-104	S-1044	DT	1079	S-1085	
2																	
3	"	1	2	5	any	1.2	3.0	0.25	2.2	B	P1721	B3X-104	S-1045	DX	1052	S-1086	
4																	
5	(Coded)	1	2	110	60	1.2	3.0	0.5	4.40	C	P1715	B3T-204	S-1046	DT	1078	S-1087	
6																	
7	Signal-Interlocking	4-6	6-9	110	50/60	8.0	13.5	0.16	0.900	A4	P1713	BT-132	S-1048	DT	1066	S-1089	
8																	
9	" "	4-6	6-9	20	60	8.0	13.5	0.16	0.900	A4	P1723	BX-132	S-1049	DX	1042	S-1090	
10																	
11	" "	4-6	6-9	110	50/60	8.0	13.5	0.25	1.70	B11	P1715	BT-232	S-1050	DT	1062	S-1091	
12																	
13	" "	4-6	6-9	20	60	8.0	13.5	0.25	1.70	A4	P1725	BX-232	S-1051	DX	1040	S-1092	
14																	
15	" "	4-6	6-9	110	60/100	8.0	13.5	0.50	2.70	B16	P1717	BT-432	S-1052	DT	2739	S-1093	
16																	
17	" "	4-6	6-9	20	60	8.0	13.5	0.50	2.70	A5	P1727	BX-432	S-1053	DX	1038	S-1094	
18																	
19	H'wy X'ing Signals	7-10	10-14	110	60	14.0	22.0	0.35	1.50	B13	P1717	BT-432	S-1055	DHX	1093	S-1096	
20																	
21	" " "	7-12	10-18	110	60	14.0	27.0		2.7					DH	1107	S-1097	Intermittent rating 4.8 amp.
22																	
23	" " "	6-12	9-18	110	60/100	Taper Charger								Style K	CSU21045		See Note 1
24																	
25	Remote Control	10-12	14-20	110	60	20	30	0.16	0.60	B3	P1715	BT-232	S-1057	DT	1058	S-1099	
26																	
27	" "	10-12	14-20	110	60	20	30	0.25	1.20	B10	P1717	BT-432	S-1058	DT	2052	S-1100	
28																	
29	Interlocking	55-65	80-95	110	60	120	145	0.06	0.75	B	P1745	BP-248	S-1060	DP	1336	S-1102	
30																	
31	"	55-65	80-95	110	50/100	120	145	0.25	1.50	B5	P1746	BP-448	S-1061	DP	1240	S-1103	
32																	
33	"	55-65	80-95	110	60	120	145	0.35	2.25	B2	P1747	BP-648	S-1062	DP	1241	S-1104	
34																	
35	"	55-65	80-95	110	50/60	120	145	0.35	3.0	A2	P1748	BP-848	S-1063	DP	1242	S-1105	
36	Special	2	2-4	110	60	3	7	0.25	2.20	B	P1713	B3T-108	S-1075	DT	1072	S-1115	Explain need on order.
37	"	5-10	7-14	110	60	10	22	1.50	10.5	B9	P1747	BP-648	S-1076	DP	1372	S-1116	" " " "
38	"	5-10	7-14	110	60	10	22	0.50	4.5	B15	P1745	BP-248	S-1077	DP	1376	S-1117	" " " "
39	"	55-65	80-95	110	60	120	145	0.70	6.0	A	P1750	BP-1648	S-1078	DP	1334	S-1118	" " " "
40	"	5-10	7-14	110	60	10	22	1.0	7.0	B20	P1746	BP-448	S-1079	DP	1374	S-1119	" " " "
41																	
42	CTC Line	20-70	26-103	110	60	40	155	0.03	0.20	A	P1752	BPC-280	S-1081	DP	2711	S-1120	
43																	
44	CTC Local	11-14	14-20	110	60	20	30	1.0	6.0	B15	P1746	BP-448	S-1082	DP	1366	S-1121	
45																	
46																	
47																	
48																	
49																	

TYPICAL ORDERING REFERENCE:

Rectifier, Input 110 volt, 60 cycle, for charging 1 lead cell at 2.2 amp. maximum. Item-1, B.&O. Plan I-126-B.

Notes:

1 - Emergency rating 5-7 amperes to low battery

Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

USAGE TABLE FOR BATTERY CHARGING RECTIFIERS

Office of Signal Engineer
Baltimore, Md
Aug 27, 1953

Revised 4-1-55 (Item 5)
Revised 5-17-55 account adding F

I-126-B

1- Instrument.

a. A direct reading megohmmeter having a self contained source of direct current test voltage, rating 500 volts with range from zero to 100 megohms.

2- Leads.

a. Single-conductor stranded wire, having high quality insulation, with lugs for connecting to the instrument and suitable clips for connecting to apparatus under test.

b. Connect leads to the instrument binding posts, twist the insulated portion of the leads loosely together and see that terminals at the free end are separated and clear of all objects. Operate the instrument as directed and if the leads are properly insulated the pointer should read infinity on the scale, indicating no leakage between leads. If any leakage exists, other leads must be obtained and tested in the same manner.

c. Then touch the test end of leads together to make sure they are not disconnected or broken. With leads connected together instrument should read zero.

3- Weather.

a. Open line circuits shall be tested when weather is dry.

b. All other circuits can be tested when weather is favorable, except that circuits outside of instrument cases and housings will not be tested when temperature is below freezing.

4- Surface leakage.

a. If low readings are found it should be determined that no surface leakage exists at battery or other exposed connections before concluding that the low reading is due to a weakened condition of the insulation.

5- Precautions.

a. When making test of apparatus, it must be known that no unsafe conditions are set up by the application of testing equipment.

6- Procedure.

a. Test each circuit separately or, where practicable, a group of circuits, all of which are electrically connected at the time of test. Connect one terminal of the instrument to one wire or part of the interconnected circuit or circuits and the other terminal to ground and operate the instrument as directed. If the circuit or circuits under test are found to have an insulation resistance lower than required for any one circuit in the group, the circuit or circuits should be segregated and test repeated until defective insulation is found. When the insulation resistance is found to be lower than required, the defect must be repaired, or the wire or part replaced as soon as possible and another test made.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR TESTING INSULATION RESISTANCE OF SIGNAL CIRCUITS AND APPARATUS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 21, 1949

Sheet No. I

7- Record.

a. The results of tests shall be recorded on Form 968-G.

b. Each circuit shall be recorded in its entirety, except when not meeting requirements such a circuit will be tested in sections to determine the section having low resistance and each section recorded if unable to clear at that time.

Approved : C A Hunt
Chief Engineer Comm. & Signals

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR TESTING INSULATION RESISTANCE
OF SIGNAL CIRCUITS AND APPARATUS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 21, 1949

RECEIVED
AUG 8 1949
SPECIFICATION DEPT.

1- General.

a. Standard Plan S-146, Line Wire Splices and Ties, together with applicable standard plans of the 500 series form a part of these instructions.

b. Line wire shall be in accordance with B.& O. Specifications L-1-5 or L-1-5a.

c. Signal wires and cables of less than 150 volts shall be placed in a position below the communication circuits on a pole line. Such signal wires shall be carried on crossarms used exclusively for signal circuits.

d. Signal circuits of 150 volts or more shall be considered as signal supply circuits.

e. Signal supply wires or cables shall be constructed above communication wires.

(1) Signal supply circuits conductors shall not be smaller than No. 6 AWG hard drawn copper or its equivalent in strength.
(2) Signal supply circuits shall be placed on the end and adjacent pins of the signal crossarm. The supply circuits shall be rendered conspicuous by the use of white porcelain insulaters.

2- Use of Double Crossarms.

a. On poles at railroad crossings.

b. On poles at crossings over trolley contact wires.

c. On corner poles having a "pull" of more than twenty feet.

d. On head guyed poles adjacent to corner poles.

e. On poles at terminals.

f. On head guyed poles adjacent to end terminals.

g. On poles where the upward or downward "pull" exceed eight feet.

3- Attachment of Crossarms.

a. Crossarms shall be attached at right angles to the pole and in verticle alignment. Each crossarm shall be secured by means of a standard crossarm bolt fitted with two 2-1/4 inch square washers. In all cases, the bolt shall be driven through from the back of the pole.

b. Double crossarms shall be clamped together near each end with double arming bolt equipped with four nuts and four 2-1/4 inch square washers.

c. Where double crossarms are employed, gains will only be required for the arms on one side of the pole.

4- Crossarm Braces.

a. Crossarms on single poles shall, in general, be provided with standard crossarm braces. The braces shall be attached to the back of the crossarm by 3/8 x 4 inch carriage bolts and to the pole by a 1/2 x 4-1/2 inch fetter drive screw.

b. Double crossarms should ordinarily have only one pair of braces. However, on end terminal poles, where more than two crossarms are carried and on intermediate terminal poles, where double crossarms are used, each arm of the double crossarms shall be equipped with standard crossarm braces.

5- Pins.

a. Standard 1/2 inch steel pins shall be used where standard steel pin crossarms are employed.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

b. Standard 1-1/4 x 8-1/4 inch wood pins shall be used where standard wood pin crossarms are employed.

c. Crossarms shall be fitted with only a sufficient number of pins to accommodate the wires to be immediately strung. Each arm of double crossarms should be equipped with pins except at terminal poles where wires dead-end.

d. Wood pins shall be installed by driving the pin into the crossarm until the shoulder of the pin is flush with the top of the arm. Care should be exercised in driving the pin so as not to injure the threads. A 6-d galvanized nail shall be driven through the side of the crossarm into the pin to hold it in place.

6- Insulators..

a. Line wires should normally be supported on standard side groove insulators. Top groove insulators, however, should be used at poles where there is a heavy downward pull, and in localities where exceptionally heavy snow or ice loadings are apt to be experienced. Standard shackle insulators shall be used for dead-ending.

7- Tying Wires on Insulators.

a. Tie No. 1462 should normally be used, however, tie No. 1463 may be used where experience has shown that tie No. 1462 does not hold the wire in the groove satisfactorily.

8- Location of Wires on Insulators.

a. In straight sections, line wires carried on single poles should normally be placed on the pole side of all side groove insulators. However, in localities where most of the heavy winds come from one direction, wires should be placed on the windward side of the insulators.

b. At corners, wires on single poles shall be placed so as to pull against the insulators.

c. Where top groove insulators are used, wires in straight sections should be attached in the top groove. At corners, the wires should be attached in the side groove so as to pull against the insulators.

9- Cutting Slack in Wires.

a. Where frequent wire breaks have been experienced in a line and the wires have sags smaller than those specified in Table 1, consideration should be given to cutting in slack.

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SPECIFICATION DEPT.

10- Stringing wires.

a. The sags and tensions shown in Table 1 should be employed for stringing new wire.

Table 1 -

Stringing Sags and Tensions for Signal Line Wire

	Sag in Inches All Wires		Tension in Pounds -						
Stringing Temp.	100 ft. Span	130 ft. Span	#6 HD Copper DBWP	#4 HD Copper DBWP	#8 CW 30% DBWP	#10 CW 30% DBWP	#9 BWG Iron DBWP	#2 ACSR DBWP	#6 HD Copper Bare
0° F.	4-1/2	7-1/2	335	505	205	145	255	410	265
20° F.	5-1/2	9-1/2	270	405	165	115	205	330	215
40° F.	7	12	215	320	130	90	160	260	170
60° F.	9	15	170	250	100	70	125	205	135
80° F.	11-1/2	20	130	190	80	55	100	155	100
100° F.	14	24	105	160	65	45	80	130	85

b. In determining the proper stringing sags or tensions from Table 1, it will be necessary to first obtain the air temperature by means of an approved line wire thermometer. This temperature shall be determined by readings taken on a pole in an exposed location. The sag or tension value corresponding to the termperature which is nearest to that indicated by the thermometer should, in general, be used. However, where the temperature is approximately midway between the temperatures indicated in the table, the sag or tension halfway between those specified for the next higher and lower temperatures should be used.

c. In stringing wire by sag, sag board or other approved sighting devices should be used.

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11- Splicing Copper or Copper Covered Steel Wires.

a. Splices in copper and copper covered steel line wire shall be made with double tube twist type sleeves or approved type of compression sleeves.

b. In splicing wire with compression sleeves the following procedure shall be carried out:-

(1) Thoroughly clean with emery cloth or an approved equivalent the portions of the wires to be inserted in the sleeve. This is just as essential for new wire as for old wire. Under no conditions are the wires to be wiped either with the fingers or a rag after cleaning.

(2) Push the end of one wire into the sleeve until it is stopped by the groove in the center of the sleeve. With side-cutting pliers, pinch the sleeve close to the center of the groove which will hold the wire in place. Then place the other end of the wire in the opposite end of the sleeve and proceed as described before. With the compression tool held at right angles to the sleeve and make three compressions between center groove and each end of sleeve.

(3) Before a twist splice is made the ends of the wires in all cases must be thoroughly cleaned with emery cloth or an approved equivalent.

12- Splicing Steel Line Wire.

a. Steel line wire may be spliced with tinned double tube copper twist sleeves or by means of a twisted and soldered joint. Where sleeves are used the splice shall be made in accordance with No. 1464, Dwg. S-146. The twisted and soldered splice shall be made in accordance with No. 1465, Dwg. S-146. Before a splice is made in steel line wire, thoroughly clean the portions of the wires to be included with emery cloth or an approved equivalent.

APPROVED: ______________________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

RECEIVED
MAY 23 1949
SPECIFICATION DEPT.

1- General.

a. Standard Plan S-140, Line Wire Splices and Ties, together with applicable standard plans of the 500 series form a part of these instructions.

b. Line wire shall be in accordance with B.& O. Specifications L-1-5 or L-1-5a.

c. Single-phase a-c or 2-wire d-c circuits carrying a voltage of 150 - 550 volts between conductors, with transmitted power not in excess of 3200 watts may be carried below communication conductors, at not less than 10 feet above ground, under the following conditions:

(1) That such supply circuits are of wire having a good grade of commercial double-braid weatherproof covering, or its equivalent, not smaller than No.6 AWG medium hard-drawn copper or its equivalent in strength, and the construction otherwise conforms with the requirements for supply circuits of the same class.

(2) That the supply circuits be placed on the end and adjacent pins of the lowest through signal crossarm and that a 33-inch climbing space be maintained from the ground up to a point at least 24 inches above the supply circuits. The supply circuits shall be rendered conspicuous by the use of insulators of different color from others on the pole line.

(3) That there shall be a vertical clearance of at least 2 feet between the crossarm carrying these supply circuits and the next crossarm above. The other pins on the crossarm carrying the supply circuits may be occupied by communication circuits used in the operation or control of a signal system or other supply system.

(4) That such supply circuits shall be equipped with arresters and fuses installed in the supply end of the circuit and where the signal circuit is alternating current, the protection shall be installed on the secondary side of the supply transformer. The arresters shall be designed so as to break down at approximately twice the voltage between the wires of the circuit, but the break-down voltage of the arrester need not be less than 1.000 volts. The fuses shall have a rating not in excess of approximately twice the maximum operating current of the circuit, but their rating need not be less than 10 amperes. The fuses likewise shall in all cases have a rating of at least 600 volts and, where supply transformer is a step-down transformer, shall be capable of opening the circuit successfully in event the transformer primary voltage is impressed upon them.

(5) Such supply circuits when enclosed in effectively grounded metal-sheathed cable, or other cables carried on effectively grounded messenger, may be carried on a pole below communication attachments, with not less than 2 ft. vertical separation between the supply cable and the lowest communication crossarm. Communication circuits other than those used in connection with the operation of the supply circuits shall not be carried in the same cable with such supply circuits.

(6) Where such supply conductors are carried below communication conductors, transformers and other apparatus associated therewith shall be attached only to the sides of the crossarm in the space between and at no higher level than, such supply wires.

(7) Lateral runs of such supply circuits carried in a position below the communication space shall be protected through the climbing space by wood molding or equivalent covering, or shall be carried in multiple-conductor cable having a suitable substantial insulating covering, and such lateral runs shall be placed on the under side of the crossarm.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LINE WIRE CONSTRUCTION

Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

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SPECIFICATION DEPT.

2- Use of Double Crossarms.

a. On poles at railroad crossings.

b. On poles at crossings over trolley contact wires.

c. On corner poles having a "pull" of more than twenty feet.

d. On head guyed poles adjacent to corner poles.

e. On poles at terminals.

f. On head guyed poles adjacent to end terminals.

g. On poles where the upward or downward "pull" exceed eight feet.

3- Attachment of Crossarms.

a. Crossarms shall be attached at right angles to the pole and in vertical alignment. Each crossarm shall be secured by means of a standard crossarm bolt fitted with two 2-1/4 inch square washers. In all cases, the bolt shall be driven through from the back of the pole.

b. Double crossarms shall be clamped together near each end with double arming bolt equipped with four nuts and four 2-1/4 inch square washers.

c. Where double crossarms are employed, gains will only be required for the arms on one side of the pole.

4- Crossarm Braces.

a. Crossarms on single poles shall, in general, be provided with standard crossarm braces. The braces shall be attached to the back of the crossarm by 3/8 x 4 inch carriage bolts and to the pole by a 1/2 x 4-1/2 inch fetter drive screw.

b. Double crossarms should ordinarily have only one pair of braces. However, on end terminal poles, where more than two crossarms are carried and on intermediate terminal poles, where double crossarms are used, each arm of the double crossarms shall be equipped with standard crossarm braces.

5- Pins.

a. Standard 1/2 inch steel pins shall be used where standard steel pin crossarms are employed.

b. Standard 1-1/4 x 8-1/4 inch wood pins shall be used where standard wood pin crossarms are employed.

c. Crossarms shall be fitted with only a sufficient number of pins to accommodate the wires to be immediately strung. Each arm of double crossarms should be equipped with pins except at terminal poles where wires dead-end.

d. Wood pins shall be installed by driving the pin into the crossarm until the shoulder of the pin is flush with the top of the arm. Care should be exercised in driving the pin so as not to injure the threads. A 6-d galvanized nail shall be driven through the side of the crossarm into the pin to hold it in place.

6- Insulators.

a. Line wires should normally be supported on standard side groove insulators. Top groove insulators, however, should be used at poles where there is a heavy downward pull, and in localities where exceptionally heavy snow or ice loadings are apt to be experienced. Standard shackle insulators shall be used for dead-ending.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

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SPECIFICATION DEPT.

7- Tying Wires on Insulators.

a. Tie No. 1462 should normally be used, however, tie No. 1463 may be used where experience has shown that tie No. 1462 does not hold the wire in the groove satisfactorily.

8- Location of Wires on Insulators.

a. In straight sections, line wires carried on single poles should normally be placed on the pole side of all side groove insulators. However, in localities where most of the heavy winds come from one direction, wires should be placed on the windward side of the insulators.

b. At corners, wires on single poles shall be placed so as to pull against the insulators.

c. Where top groove insulators are used, wires in straight sections should be attached in the top groove. At corners, the wires should be attached in the side groove so as to pull against the insulators.

9- Splicing Copper or Copper Covered Steel Wires.

a. Splices in copper and copper covered steel line wire shall be made with double tube twist type sleeves or approved type of compression sleeves.

b. In splicing wire with compression sleeves the following procedure shall be carried out:-

(1) Thoroughly clean with emery cloth or an approved equivalent the portions of the wires to be inserted in the sleeve. This is just as essential for new wire as for old wire. Under no conditions are the wires to be wiped either with the fingers or a rag after cleaning.

(2) Push the end of one wire into the sleeve until it is stopped by the groove in the center of the sleeve. With side-cutting pliers, pinch the sleeve close to the center of the groove which will hold the wire in place. Then place the other end of the wire in the opposite end of the sleeve and proceed as described before. With the compression tool held at right angles to the sleeve then make three compressions between center groove and each end of sleeve.

(3) Before a twist splice is made the ends of the wires in all cases must be thoroughly cleaned with emery cloth or an approved equivalent.

10- Splicing Steel Line Wire.

a. Steel line wire may be spliced with tinned double tube copper twist sleeves or by means of a twisted and soldered joint. Where sleeves are used the splice shall be made in accordance with No. 1464, Dwg. S-146. The twisted and soldered splice shall be made in accordance with No. 1465, Dwg. S-146. Before a splice is made in steel line wire, thoroughly clean the portions of the wires to be included with emery cloth or an approved equivalent.

11- Cutting Slack in Wires.

a. Where frequent wire breaks have been experienced in a line and the wires have sags smaller than those specified in Table 1, consideration should be given to cutting in slack.

12- Stringing wires.

a. The sags and tensions shown in Table 1 should be employed for stringing new wire.

Table 1 -

Stringing Sags and Tensions for Signal Line Wire

	Sag in Inches All Wires		Tension in Pounds -						
Stringing Temp.	100 ft. Span	130 ft. Span	#6 HD Copper DBWP	#4 HD Copper DBWP	#8 CW 30% DBWP	#10 CW 30% DBWP	#9 BWG Iron DBWP	#2 ACSR DBWP	#6 HD Copper Bare
0° F.	4-1/2	7-1/2	335	505	205	145	255	410	265
20° F.	5-1/2	9-1/2	270	405	165	115	205	330	215
40° F.	7	12	215	320	130	90	160	260	170
60° F.	9	15	170	250	100	70	125	205	135
80° F.	11-1/2	20	130	190	80	55	100	155	100
100° F.	14	24	105	160	65	45	80	130	85

b. In determining the proper stringing sags or tensions from Table 1, it will be necessary to first obtain the air temperature by means of an approved line wire thermometer. This temperature shall be determined by readings taken on a pole in an exposed location. The sag or tension value corresponding to the termperature which is nearest to that indicated by the thermometer should, in general, be used. However, where the temperature is approximately midway between the temperatures indicated in the table, the sag or tension halfway between those specified for the next higher and lower temperatures should be used.

Approved :
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

Paragraph I-C revised to permit installation
of 150-550 volt signal supply circuits
beneath communication circuits. 7-7-49.

1- General.

a. Standard Plan S-146, Line Wire Splices and Ties, together with applicable standard plans of the 500 series form a part of these instructions.

b. Line wire shall be in accordance with B.&.O. Specifications L-1-5 or L-1-5a.

c. Line wires must be kept free from contact with guy wires, trees or structures.

d. Single-phase a-c or 2-wire d-c circuits carrying a voltage of 150 - 550 volts between conductors, with transmitted power not in excess of 3200 watts may be carried below communication conductors, at not less than 10 feet above ground, under the following conditions:

(1) That such supply circuits are of wire having a good grade of commercial double-braid weatherproof covering, or its equivalent, not smaller than No.6 AWG medium hard-drawn copper or its equivalent in strength, and the construction otherwise conforms with the requirements for supply circuits of the same class.

(2) That the supply circuits be placed on the end and adjacent pins of the lowest through signal crossarm and that a 33-inch climbing space be maintained from the ground up to a point at least 24 inches above the supply circuits. The supply circuits shall be rendered conspicuous by the use of insulators of different color from others on the pole line.

(3) That there shall be a vertical clearance of at least 2 feet between the crossarm carrying these supply circuits and the next crossarm above. The other pins on the crossarm carrying the supply circuits may be occupied by communication circuits used in the operation or control of a signal system or other supply system.

(4) That such supply circuits shall be equipped with arresters and fuses installed in the supply end of the circuit and where the signal circuit is alternating current, the protection shall be installed on the secondary side of the supply transformer. The arresters shall be designed so as to break down at approximately twice the voltage between the wires of the circuit, but the break-down voltage of the arrester need not be less than 1,000 volts. The fuses shall have a rating not in excess of approximately twice the maximum operating current of the circuit, but their rating need not be less than 10 amperes. The fuses likewise shall in all cases have a rating of at least 600 volts and, where supply transformer is a step-down transformer, shall be capable of opening the circuit successfully in event the transformer primary voltage is impressed upon them.

(5) Such supply circuits when enclosed in effectively grounded metal-sheathed cable, or other cables carried on effectively grounded messenger, may be carried on a pole below communication attachments, with not less than 2 ft. vertical separation between the supply cable and the lowest communication crossarm. Communication circuits other than those used in connection with the operation of the supply circuits shall not be carried in the same cable with such supply circuits.

(6) Where such supply conductors are carried below communication conductors, transformers and other apparatus associated therewith shall be attached only to the sides of the crossarm in the space between and at no higher level than, such supply wires.

(7) Lateral runs of such supply circuits carried in a position below the communication space shall be protected through the climbing space by wood molding or equivalent covering, or shall be carried in multiple-conductor cable having a suitable substantial insulating covering, and such lateral runs shall be placed on the under side of the crossarm.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

Sheet No.1

I-130-B

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SPECIFICATION DEPT.

2- Use of Double Crossarms.

a. On poles at railroad crossings.

b. On poles at crossings over trolley contact wires.

c. On corner poles having a "pull" of more than twenty feet.

d. On head guyed poles adjacent to corner poles.

e. On poles at terminals.

f. On head guyed poles adjacent to end terminals.

g. On poles where the upward or downward "pull" exceed eight feet.

3- Attachment of Crossarms.

a. Crossarms shall be attached at right angles to the pole and in vertical alignment. Each crossarm shall be secured by means of a standard crossarm bolt fitted with two 2-1/4 inch square washers. In all cases, the bolt shall be driven through from the back of the pole.

b. Double crossarms shall be clamped together near each end with double arming bolt equipped with four nuts and four 2-1/4 inch square washers.

c. Where double crossarms are employed, gains will only be required for the arms on one side of the pole.

4- Crossarm Braces.

a. Crossarms on single poles shall, in general, be provided with standard crossarm braces. The braces shall be attached to the back of the crossarm by 3/8 x 4½ inch carriage bolts and to the pole by a 1/2 x 4-1/2 inch fetter drive screw.

b. Double crossarms should ordinarily have only one pair of braces. However, on end terminal poles, where more than two crossarms are carried and on intermediate terminal poles, where double crossarms are used, each arm of the double crossarms shall be equipped with standard crossarm braces.

5- Pins.

a. Standard 1/2 inch steel pins shall be used where standard steel pin crossarms are employed.

b. Standard 1-1/4 x 8-1/4 inch wood pins shall be used where standard wood pin crossarms are employed.

c. Crossarms shall be fitted with only a sufficient number of pins to accommodate the wires to be immediately strung. Each arm of double crossarms should be equipped with pins except at terminal poles where wires dead-end.

d. Wood pins shall be installed by driving the pin into the crossarm until the shoulder of the pin is flush with the top of the arm. Care should be exercised in driving the pin so as not to injure the threads. A 6-d galvanized nail shall be driven through the side of the crossarm into the pin to hold it in place.

6- Insulators.

a. Line wires should normally be supported on standard side groove insulators. Top groove insulators, however, should be used at poles where there is a heavy downward pull, and in localities where exceptionally heavy snow or ice loadings are apt to be experienced. Standard shackle insulators shall be used for dead-ending.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

Paragraph 1-C revised to permit installation
of 150-550 volt si supply circuits
beneath communic circuits. 7-7-49.

Paragraphs 1-c, 12 a & b changed to 1-d, 8, 14 a & b.
New paragraphs 1-c, 12 a & b, 13a added. 4-5-50.

1- General.

a. Standard Plan S-146, Line Wire Splices and Ties, together with applicable standard plans of the 500 series form a part of these instructions.

b. Line wire shall be in accordance with B.&.O. Specifications L-1-5 or L-1-5a.

c. Line wires must be kept free from contact with guy wires, trees or structures.

d. Single-phase a-c or 2-wire d-c circuits carrying a voltage of 150 - 550 volts between conductors, with transmitted power not in excess of 3200 watts may be carried below communication conductors, at not less than 10 feet above ground, under the following conditions:

(1) That such supply circuits are of wire having a good grade of commercial double-braid weatherproof covering, or its equivalent, not smaller than No.6 AWG medium hard-drawn copper or its equivalent in strength, and the construction otherwise conforms with the requirements for supply circuits of the same class.

(2) That the supply circuits be placed on the end and adjacent pins of the lowest through signal crossarm and that a 33-inch climbing space be maintained from the ground up to a point at least 24 inches above the supply circuits. The supply circuits shall be rendered conspicuous by the use of insulators of different color from others on the pole line.

(3) That there shall be a vertical clearance of at least 2 feet between the crossarm carrying these supply circuits and the next crossarm above. The other pins on the crossarm carrying the supply circuits may be occupied by communication circuits used in the operation or control of a signal system or other supply system.

(4) That such supply circuits shall be equipped with arresters and fuses installed in the supply end of the circuit and where the signal circuit is alternating current, the protection shall be installed on the secondary side of the supply transformer. The arresters shall be designed so as to break down at approximately twice the voltage between the wires of the circuit, but the break-down voltage of the arrester need not be less than 1,000 volts. The fuses shall have a rating not in excess of approximately twice the maximum operating current of the circuit, but their rating need not be less than 10 amperes. The fuses likewise shall in all cases have a rating of at least 600 volts and, where supply transformer is a step-down transformer, shall be capable of opening the circuit successfully in event the transformer primary voltage is impressed upon them.

(5) Such supply circuits when enclosed in effectively grounded metal-sheathed cable, or other cables carried on effectively grounded messenger, may be carried on a pole below communication attachments, with not less than 2 ft. vertical separation between the supply cable and the lowest communication crossarm. Communication circuits other than those used in connection with the operation of the supply circuits shall not be carried in the same cable with such supply circuits.

(6) Where such supply conductors are carried below communication conductors, transformers and other apparatus associated therewith shall be attached only to the sides of the crossarm in the space between and at no higher level than, such supply wires.

(7) Lateral runs of such supply circuits carried in a position below the communication space shall be protected through the climbing space by wood molding or equivalent covering, or shall be carried in multiple-conductor cable having a suitable substantial insulating covering, and such lateral runs shall be placed on the under side of the crossarm.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LINE WIRE CONSTRUCTION

Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

2- Use of Double Crossarms.

a. On poles at railroad crossings.

b. On poles at crossings over trolley contact wires.

c. On corner poles having a "pull" of more than twenty feet.

d. On head guyed poles adjacent to corner poles.

e. On poles at terminals.

f. On head guyed poles adjacent to end terminals.

g. On poles where the upward or downward "pull" exceed eight feet.

3- Attachment of Crossarms.

a. Crossarms shall be attached at right angles to the pole and in vertical alignment. Each crossarm shall be secured by means of a standard crossarm bolt fitted with two 2-1/4 inch square washers. In all cases, the bolt shall be driven through from the back of the pole.

b. Double crossarms shall be clamped together near each end with double arming bolt equipped with four nuts and four 2-1/4 inch square washers.

c. Where double crossarms are employed, gains will only be required for the arms on one side of the pole.

4- Crossarm Braces.

a. Crossarms on single poles shall, in general, be provided with standard crossarm braces. The braces shall be attached to the back of the crossarm by 3/8 x 4½ inch carriage bolts and to the pole by a 1/2 x 4-1/2 inch fetter drive screw.

b. Double crossarms should ordinarily have only one pair of braces. However, on end terminal poles, where more than two crossarms are carried and on intermediate terminal poles, where double crossarms are used, each arm of the double crossarms shall be equipped with standard crossarm braces.

5- Pins.

a. Standard 1/2 inch steel pins shall be used where standard steel pin crossarms are employed.

b. Standard 1-1/4 x 8-1/4 inch wood pins shall be used where standard wood pin crossarms are employed.

c. Crossarms shall be fitted with only a sufficient number of pins to accommodate the wires to be immediately strung. Each arm of double crossarms should be equipped with pins except at terminal poles where wires dead-end.

d. Wood pins shall be installed by driving the pin into the crossarm until the shoulder of the pin is flush with the top of the arm. Care should be exercised in driving the pin so as not to injure the threads. A 6-d galvanized nail shall be driven through the side of the crossarm into the pin to hold it in place.

6- Insulators.

a. Line wires should normally be supported on standard side groove insulators. Top groove insulators, however, should be used at poles where there is a heavy downward pull, and in localities where exceptionally heavy snow or ice loadings are apt to be experienced. Standard shackle insulators shall be used for dead-ending.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR LINE WIRE CONSTRUCTION

Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

7- Tying Wires on Insulators.

a. Tie No. 1462 should normally be used, however, tie No. 1463 may be used where experience has shown that tie No. 1462 does not hold the wire in the groove satisfactorily.

8- Location of Wires on Insulators.

a. In straight sections, line wires carried on single poles should normally be placed on the pole side of all side groove insulators. However, in localities where most of the heavy winds come from one direction, wires should be placed on the windward side of the insulators.

b. At corners, wires on single poles shall be placed so as to pull against the insulators.

c. Where top groove insulators are used, wires in straight sections should be attached in the top groove. At corners, the wires should be attached in the side groove so as to pull against the insulators.

9- Splicing Copper or Copper Covered Steel Wires.

a. Splices in copper and copper covered steel line wire shall be made with double tube twist type sleeves or approved type of compression sleeves.

b. In splicing wire with compression sleeves the following procedure shall be carried out:-

(1) Thoroughly clean with emery cloth or an approved equivalent the portions of the wires to be inserted in the sleeve. This is just as essential for new wire as for old wire. Under no conditions are the wires to be wiped either with the fingers or a rag after cleaning.
(2) Push the end of one wire into the sleeve until it is stopped by the groove in the center of the sleeve. With side-cutting pliers, pinch the sleeve close to the center of the groove which will hold the wire in place. Then place the other end of the wire in the opposite end of the sleeve and proceed as described before. With the compression tool held at right angles to the sleeve then make three compressions between center groove and each end of sleeve.
(3) Before a twist splice is made the ends of the wires in all cases must be thoroughly cleaned with emery cloth or an approved equivalent.

10- Splicing Steel Line Wire.

a. Steel line wire may be spliced with tinned double tube copper twist sleeves or by means of a twisted and soldered joint. Where sleeves are used the splice shall be made in accordance with No. 1464, Dwg. S-146. The twisted and soldered splice shall be made in accordance with No. 1465, Dwg. S-146. Before a splice is made in steel line wire, thoroughly clean the portions of the wires to be included with emery cloth or an approved equivalent.

11- Cutting Slack in Wires.

a. Where frequent wire breaks have been experienced in a line and the wires have sags smaller than those specified in Table 1, consideration should be given to cutting in slack.

12- Dead Ends.

a. Dead ending shackle assembly shall be in accordance with No.1320, Dwg. S-132.

b. Dead ends shall be installed in accordance with Dwg. S-131.

13- Wire and Cable Drops.

a. Wire and cable drops shall be installed in accordance with Dwg. S-133.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

14- Stringing wires.

a. The sags and tensions shown in Table 1 should be employed for stringing new wire.

Table 1 -

Stringing Sags and Tensions for Signal Line Wire

Stringing Temp.	Sag in Inches All Wires		Tension in Pounds -						
	100 ft. Span	130 ft. Span	#6 HD Copper DBWP	#4 HD Copper DBWP	#8 CW 30% DBWP	#10 CW 30% DBWP	#9 BWG Iron DBWP	#2 ACSR DBWP	#6 HD Copper Bare
0° F.	4-1/2	7-1/2	335	505	205	145	255	410	265
20° F.	5-1/2	9-1/2	270	405	165	115	205	330	215
40° F.	7	12	215	320	130	90	160	260	170
60° F.	9	15	170	250	100	70	125	205	135
80° F.	11-1/2	20	130	190	80	55	100	155	100
100° F.	14	24	105	160	65	45	80	130	85

b. In determining the proper stringing sags or tensions from Table 1, it will be necessary to first obtain the air temperature by means of an approved line wire thermometer. This temperature shall be determined by readings taken on a pole in an exposed location. The sag or tension value corresponding to the termperature which is nearest to that indicated by the thermometer should, in general, be used. However, where the temperature is approximately midway between the temperatures indicated in the table, the sag or tension halfway between those specified for the next higher and lower temperatures should be used.

Approved : A S Hunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR LINE WIRE CONSTRUCTION
Office of Chief Engineer Communications & Signals
Baltimore, Md.
July 7, 1949

Paragraph I-C revised to permit installation of 150-550 volt si supply circuits beneath communic circuits. 7-7-49.

Paragraphs I-c, 12a&b changed to I-d, &14a&b. New paragraphs I-c, 12a&b, 13a added. 4-5-50.

Paragraph I-C revised to permit installation
of 150-550 volt sid [illegible] supply circuits
beneath communica [illegible] circuits. 7-7-49.

Paragraphs I-c, 12a&b changed to I-d, 8, 14a&b.
New paragraphs I-c, 12a&b, 15a added. 4-5-50

1- General

a. Wire and cable shall conform to current Instructions I-100.

b. The handling, laying and pulling in of wires and cables shall be in accordance with current Instructions for Wire and Cable, I-100.

c. Wires between terminals and instruments shall be of sufficient length to allow access for inspection of apparatus.

d. Wiring in relay cases, relay housings, junction and lightning arrester boxes shall be uniform for like apparatus.

e. Except when AMP terminals are used, not more than two wires shall be connected to one binding post or terminal screw.

f. Wire and cable shall be continuous, without joints or splices between terminals except line wire.

g. In removing insulation or weatherproof covering from wire, do not cut with knife at a right angle to the wire because a very slight nick may cause the wire to break at that point when subjected to strain or vibration.

h. Line construction shall be in accordance with current Instructions I-125 and I-130.

i. Lightning arresters and grounds shall be installed in accordance with current Instructions I-117 and I-119.

2- Buildings.

a. Except when lightning arresters are installed outside of the building, or the entering conductors are in cable or pass through masonry, signal conductors shall enter the building either through non-combustible non-absorptive insulating bushings, or through a metal raceway. Raceways or bushings shall slope upward from the outside or where this cannot be done drip loops shall be formed in the conductors immediately before they enter the building. Raceways shall be equipped with an approved service head. Conduits or other metallic raceways located ahead of the lightning arresters shall be grounded. Entrances for signal conductors shall be separate from electric light and power circuits.

b. Signal conductors in buildings shall be separated at least 2 inches from any light or power conductors not in conduit.

c. Conductors of signal circuits in buildings shall not be placed in any raceway, junction box, or similar fitting with conductor for light and power circuits.

d. On new work conventional relays in buildings shall be housed in enclosed metal relay cabinets. Metal relay cabinets shall be grounded in accordance with current Instructions I-117.

e. Line wires which enter buildings shall not be attached to a crossarm supporting electric light or power wires other than signal battery charging circuits with potentials not exceeding 550 volts and 3200 watts load.

3- Common return wire.

a. When a common return wire is used it shall be dead ended at each signal location and terminated to permit tests in either direction.

b. Common return wire shall be sectionalized where practicable.

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
March 16, 1950

4- Wire terminals

a. In forming eyes or applying terminals to ends of wire, the wire must not be nicked or twisted.

b. Eyelet terminals shall be used on flexible wire connections of No.9 AWG and smaller. Cup terminals shall be used for No.6 AWG stranded wire.

c. Terminal blocks shall be installed in accessible locations and neatly arranged on terminal boards and where applicable, in accordance with current Standard Plan S-126, sheets 1, 2 and 3.

d. Wires with a potential in excess of 40 volts attached to terminals shall be protected by terminal post sleeve and cap No.1376.

5- Tagging

a. Tags for marking wires shall conform to current Standard Plan S-137.

b. Wires shall be identified at all terminals by means of a non-metallic tag on which is stamped the designation corresponding to that shown on the wiring plan. Tags shall be applied in such manner that if a wire is removed from the terminal, the tag cannot be removed from the wire without cutting the wire or destroying the eyelet. Tags may be omitted from plug-in relay racks except (Brady Wire Labels) shall be applied to wires entering relay plug boards.

c. Line wires shall be identified at dead ends and taps by aluminum tag No.1371-3 nailed to vertical outer surface of crossarms adjacent to dead ends and taps.

6- Cable for direct earth installation.

a. Cables passing under or near tracks shall be buried at a sufficient depth to insure that they will not be disturbed or damaged by the normal operation of ballast cleaning machines, graders and other maintenance of way equipment. Elsewhere cable shall be buried to a uniform depth of not less than 2 feet, where practicable.

b. Cables in trench shall be surrounded with 4 in. of sand or clay, and under no circumstances shall sharp objects, or debris, especially wood, be placed in direct contact with or near the cable.

c. Cables passing under streets or highways shall be placed in galvanized steel pipe.

d. Cables shall be laid loosely in trench and back filling carefully placed to avoid disturbing cable.

e. Bends in cable shall have a radius of not less than twenty times the diameter of the cable.

f. Where cable leaves the ground at other than in buildings or foundations, it shall be protected by galvanized steel conduit extending into relay or terminal case and top filled with sealing compound.

7- Track circuit wiring.

a. Track circuit bootlegs and method of connection shall be in accordance with current Standard Plans S-108 and S-111.

b. Conductors

(1) Conductors for track circuit wiring within relay case shall be single conductor No. 14 AWG (19 strand) soft drawn insulated copper wire or equivalent.

(2) Conductor between relay case and track circuit bootleg shall be single conductor underground cable No. 9 AWG solid soft drawn copper for track circuit not exceeding 3,000 ft. in length. For track circuit exceeding 3,000 ft. in length, conductor shall be in accordance with Table 1.

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
March 16, 1950

Table 1

For Non-Coded D.C. Track Circuits Without Relay at Battery End of Circuit	FOR TRACK CIRCUITS 3000 FT. OR LONGER				
	Distance in Feet Between Relay Case and Bootleg				
	0-75	75-150	150-225	225-300	300-1000
Each relay lead	1 - #9 AWG	1 - #6 AWG	1- #9 AWG and 1- #6 AWG	2 - #6 AWG	-
Each battery lead	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG
For Coded or D.C. Circuit With Relay at Battery End of Circuit					
Each lead at both ends of circuits	1 - #9 AWG	1 - #6 AWG	1- #9 AWG and 1- #6 AWG	2 - #6 AWG	

NOTE:

1-- Table I applies on new work, replacements or where necessary to improve adjustment of existing track circuits.

2-- Supervisors and all concerned will note that Form X41 price of single conductor #9 Bronze Tape Cable is considerably higher per conductor foot than multiple conductor cable of this type. For this reason circuits should be laid out and thorough understanding had with foreman doing the work so that where convenient and economical to do so, junction boxes will be installed to REDUCE THE USE OF SINGLE CONDUCTOR BRONZE TAPE CABLE TO A MINIMUM.

Approved: ______________________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
March 16, 1950

1. General.

a. Wire and cable shall conform to current Instructions I-100.

b. The handling, laying and pulling in of wires and cables shall be in accordance with current Instructions for Wire and Cable, I-100.

c. Wires between terminals and instruments shall be of sufficient length to allow access for inspection of apparatus.

d. Wiring in relay cases, relay housings, junction and lightning arrester boxes shall be uniform for like apparatus.

e. Except when AMP terminals are used, not more than two wires shall be connected to one binding post or terminal screw.

f. Wire and cable shall be continuous, without joints or splices between terminals except line wire.

g. In removing insulation or weatherproof covering from wire, do not cut with knife at a right angle to the wire because a very slight nick may cause the wire to break at that point when subjected to strain or vibration.

h. Line construction shall be in accordance with current Instructions I-125 and I-130.

i. Lightning arresters and grounds shall be installed in accordance with current Instructions I-117 and I-119.

2. Buildings.

a. Except when lightning arresters are installed outside of the building, or the entering conductors are in cable or pass through masonry, signal conductors shall enter the building either through non-combustible non-absorptive insulating bushings, or through a metal raceway. Raceways or bushings shall slope upward from the outside or where this cannot be done drip loops shall be formed in the conductors immediately before they enter the building. Raceways shall be equipped with an approved service head. Conduits or other metallic raceways located ahead of the lightning arresters shall be grounded. Entrances for signal conductors shall be separate from electric light and power circuits.

b. Signal conductors in buildings shall be separated at least 2 inches from any light or power conductors not in conduit.

c. Conductors of signal circuits in buildings shall not be placed in any raceway, junction box, or similar fitting with conductor for light and power circuits.

BALTIMORE & OHIO RAILROAD

WIRING INSTRUCTIONS

Office of Signal Engineer
Baltimore, Md.
July 21, 1958

d. Line wires which enter buildings shall not be attached to a crossarm supporting electric light or power wires other than signal battery charging circuits with potentials not exceeding 550 volts and 3200 watts load.

3. Common return wire.

a. When a common return wire is used it shall be dead ended at each signal location and terminated to permit tests in either direction.

b. Common return wire shall be sectionalized where practicable.

4. Wire terminals.

a. In forming eyes or applying terminals to ends of wire, the wire must not be nicked or twisted.

b. Eyelet terminals shall be used on flexible wire connections of No. 9 AWG and smaller. Cup terminals shall be used for No. 6 AWG stranded wire.

c. Terminal blocks shall be installed in accessible locations and neatly arranged on terminal boards and where applicable, in accordance with current Standard Plan S-126, sheets 1, 2 and 3.

d. Wires with a potential in excess of 40 volts attached to terminals shall be protected by terminal post sleeve and cap No. 1376.

5. Tagging.

a. Tags for marking wires shall conform to current Standard Plan S-137.

b. Wires shall be identified at all terminals by means of a non-metallic tag on which is stamped the designation corresponding to that shown on the wiring plan. Tags shall be applied in such manner that if a wire is removed from the terminal, the tag cannot be removed from the wire without cutting the wire or destroying the eyelet. Tags may be omitted from plug-in relay racks except (Brady Wire Labels) shall be applied to wires entering relay plug boards.

c. Line wires shall be identified at dead ends and taps by aluminum tag No. 1371-3 nailed to vertical outer surface of crossarms adjacent to dead ends and taps.

6. Cable for direct earth installation.

a. Cables passing under or near tracks shall be buried at a sufficient depth to insure that they will not be disturbed or damaged by the normal operation of ballast cleaning machines, graders and other maintenance of way equipment. Elsewhere cable shall be buried to a uniform depth of not less than 2 feet, where practicable.

b. Cables in trench shall be surrounded with 4 in. of sand or clay, and under no circumstances shall sharp objects or debris, especially wood, be placed in direct contact with or near the cable.

c. Cables passing under streets or highways shall be placed in galvanized steel pipe.

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Signal Engineer
Baltimore, Md.
July 21, 1958

d. Cables shall be laid loosely in trench and back filling carefully placed to avoid disturbing cable.

e. Bends in cable shall have a radius of not less than twenty times the diameter of the cable.

f. Where cable leaves the ground at other than in buildings or foundations, it shall be protected by galvanized steel conduit extending into relay or terminal case and top filled with sealing compound.

7. Track and signal circuit wiring.

a. Track circuit bootlegs and method of connection shall be in accordance with current Standard Plans S-108 and S-111.

b. Conductors.

(1) Conductors for track circuit and signal lighting circuit wiring within relay case shall be single conductor No. 14 AWG (19 strand) soft drawn insulated copper wire or equivalent.

(2) Conductor between relay case and track circuit bootleg shall be single conductor underground cable No. 9 AWG solid soft drawn copper for track circuit not exceeding 3,000 ft. in length. For track circuit exceeding 3,000 ft. in length, conductor shall be in accordance with Table 1.

(3) Conductors for other apparatus shall be in accordance with Table 2.

Table 1

FOR TRACK CIRCUITS 3,000 FT. OR LONGER

	Distance in Feet Between Relay Case and Bootleg				
	0-75	75-150	150-225	225-300	300-1000
For Non-Coded D.C. Track Circuits Without Relay at Battery End of Circuit					
Each relay lead	1 - #9 AWG	1 - #6 AWG	1 - #9 AWG and 1 - #6 AWG	2 - #6 AWG	-
Each battery lead	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG	1 - #9 AWG
For Coded or D.C. Circuit With Relay at Battery End of Circuit					
Each lead at both ends of circuits	1 - #9 AWG	1 - #6 AWG	1 - #9 AWG and 1 - #6 AWG	2 - #6 AWG	-

NOTE:

1 - Table 1 applies on new work, replacements or where necessary to improve adjustment of existing track circuits.

2 - Supervisors and all concerned will note that Form X41 price of single conductor #9 Bronze Tape Cable is considerably higher per conductor foot than multiple conductor cable of this type. For this reason circuits should be laid out and thorough understanding had with foreman doing the work so that where convenient and economical to do so, junction boxes will be installed to REDUCE THE USE OF SINGLE CONDUCTOR BRONZE TAPE CABLE TO A MINIMUM.

4-19-54: Paragraph 7b(1) revised.

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Signal Engineer
Baltimore, Md.
July 21, 1958

Table 2

Controlled Device	Maximum distance in feet between Control Point and Device	
	Wire Size	
	No.9 A.W.G.	*No.6 A.W.G.*
Lighting Circuits		
One Color Position Light Signal with marker	160 (See Note 3)	320 (See Note 3)
" " " " " without marker	240 (See Note 3)	480 (See Note 3)
One Flashing Light Signal - 4 lights	240	480
" " " " 6 lights	160	320
" " " " 8 lights	120	240
One Automatic Gate and Flashing Light Signal with 4 lights	120	240
" " " " " " " " 6 lights	95	190
" " " " " " " " 8 lights	80	160
Battery Busses		
One Low Voltage Switch Machine - 24 Volt	140 (See Note 2)	280 (See Note 2)
One Automatic Gate - 30 ft. arm - Model B	55	110
" " " " " " - " S	55	110
" " " " " " - Griswold	37	75
One High Voltage Switch Machine - 120 Volt	1000	

NOTES:

(1) Battery busses must be computed in each instance for groups of high or low voltage switch machines controlled from one point.

(2) This distance may be doubled for switch machines not equipped with outboard brakes.

(3) This distance may be trippled for circuits operated from 7 cells of Lead Battery.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
WIRING INSTRUCTIONS
Office of Signal Engineer
Baltimore, Md.
July 21, 1958.
Rev. Sept. 24, 1963

Issued - 3-16-5
Revised - 7-21-58
Revised - 9-24-63

1- General.

a. To obtain best results it is important that paint be thoroughly stirred before transferring from one container to another and before applying. Paint shall be stirred until it is of the same consistency throughout.

b. When using ready mixed paint, special attention shall be given to insure thorough mixing as follows:

(1) After removing lid from container, pour off a portion of the liquid into another container.

(2) Stir the pasty mass in the bottom of the original container, then add all the liquid which was poured off, stirring constantly.

(3) Pour the paint from one container to the other several times to insure a homogeneous mixture.

2- Cleaning.

a. Surfaces covered with rust, grease, dust, loose paint or other foreign substances must be thoroughly cleaned by scraping or other suitable method before paint is applied.

3- Application.

a. Paint shall be well mixed, uniformly applied, thoroughly worked into all joints or open spaces and each coat dry before application of the succeeding coat.

b. Paint shall not be applied to wet surfaces or to outside surfaces when the temperature is below 40 degrees Fahrenheit.

c. Finishing coat shall be applied in time to be dry when an installation is complete.

4- Interlocking machines.

a. Mechanical.

(1) Machine from top of latch shoe to foundation supports, including quadrants, top plates, legs and locking frame, except finished parts shall be painted with two coats of black. The final coat shall have sufficient quantity of durable exterior varnish to produce a good gloss.

(2) Levers including latch shoes, except the portion between lever number and handle, shall be painted with black enamel, Stock W-26. Latch handles and finished parts shall not be painted. Levers between lever number and handle shall be painted with enamel as follows:

Signal levers	Red
Switch and derail levers	Black
Lock levers	Blue
Traffic levers	Gray
* Switch and lock levers	Black and Blue
Movable point frog levers	Yellow
Master lock levers	Brown
Spare levers	White

* Upper half of colored portion of switch and lock lever shall be painted black and lower half blue.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL & INTERLOCKING APPARATUS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Aug.23, 1949.

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OCT 28 1949
SPECIFICATION DEPT.

4- Interlocking machines (cont'd.).

b. Power.

(1) Cabinet of power interlocking machine, except wood cabinet, shall have two priming coats and at least one finish coat of olive green enamel.

(2) Power interlocking machine, except cabinet, levers and machined parts, shall be painted with one coat of Green Glyptal lacquer.

(3) Levers, except handles and finished parts, shall be painted with enamel to conform with color code in paragraph 4-a-(2).

5- Bungalows, Relay and Terminal Cases.

a. Interior of relay housings and terminal cases shall be painted with one coat of aluminum paint, Stock W-1.

b. Bungalows, and relay and terminal cases, except where attached to signal masts and signal bridges, shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of aluminum paint, Stock W-1.

6- Signals.

a. General.

(1) When painting signals, care should be exercised to avoid getting paint on the roundels or lenses and around shafts and bearings.

b. Backgrounds.

(1) Use scraper and wire brush to remove all rust, scale and loose paint from hoods and the face of backgrounds, then apply one coat of Rust-Oleum R-769 rust preventative damp-proof red primer. When dry examine for bright spots which indicate that scale beneath such spots has not been completely removed. Remove scale beneath such spots and reapply R-769 red primer to affected area. After satisfactory coat of R-769 red primer has been applied and allowed to dry, apply one coat of R-412 Rust-Oleum signal flat black. The R-769 red primer must be thoroughly stirred before using. To obtain best results, use the minimum quantity required and apply evenly and well brushed. In cold weather, or if used in spray gun, the R-769 red primer should be thinned with not more than 10% of Rust-Oleum thinning oil thoroughly stirred in. Turpentine or linseed oil must not be used for thinning.

c. C.P.L. Dwarf Signals.

(1) The rear of dwarf signals shall be painted with one coat of Rust-Oleum R-769 rust preventative damp-proof red primer, and one coat of Aluminum paint, Stock W-1.

d. Highway crossing signals.

(1) Masts, ladders, platforms, mechanisms, junction boxes and rear of lamp units shall be painted with one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of Aluminum paint, Stock W-1.

7- Steel and Iron Work.

a. Exterior surfaces of bracket posts, signal masts, ladders and platforms, junction boxes, switch circuit controllers, power switch machines, electric switch locks, and train control inductors shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of Black Bridge paint, Stock W-27.

b. Lids of battery boxes shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of Aluminum paint, Stock W-1.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL
& INTERLOCKING APPARATUS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Aug.23, 1949.

8- Aerial Cable.

a. Braided aerial cable shall be painted each five years except where inspection discloses that more frequent painting is desirable. Under exceptionally adverse conditions special paint and painting may be required. In such instances and where it is desirable to paint more often than each five years, approval of the Chief Engineer Communications and Signals must be secured in each instance.

b. All surfaces to be painted shall be completely covered with a uniform coat. Tape coverings, cable connections, repairs, etc., shall be given especially careful consideration to assure complete and thorough protection.

c. Cable paint applied to built-up cable shall be thoroughly worked into all interstices between the conductors.

d. Where more than one coat of cable paint is required, the previous coat shall be allowed to become dry before the next coat is applied.

e. Painting of wires and cables shall not be done when outside temperatures are 45 degrees Fahrenheit or lower.

f. Only the following approved products may be used for painting aerial braided cable:

Collins Cablekote No. 3.

D. M. C. Cable paint.

Victolac No. 12.

9- Track.

a. Base and derailing member of sliding or hinged derails shall be painted with Red Signal Enamel Stock No. W-122.

Approved: C.B. Harvey
Chief Eng'r. Maintenance

Approved: A S Hunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL
& INTERLOCKING APPARATUS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Aug. 23, 1949.

RECEIVED
OCT 28 1949
SPECIFICATION DEPT.

1. GENERAL

a. To obtain best results it is important that paint be thoroughly stirred before transferring from one container to another and before applying. Paint shall be stirred until it is of the same consistency throughout.

b. When using ready mixed paint, special attention shall be given to insure thorough mixing as follows:

(1) After removing lid from container, pour off a portion of the liquid into another container.

(2) Stir the pasty mass in the bottom of the original container, then add all the liquid which was poured off, stirring constantly.

(3) Pour the paint from one container to the other several times to insure a homogeneous mixture.

2. CLEANING

a. Surfaces covered with rust, grease, dust, loose paint or other foreign substances must be thoroughly cleaned by scraping or other suitable method before paint is applied.

3. APPLICATION

a. Paint shall be well mixed, uniformly applied, thoroughly worked into all joints or open spaces, and each coat dry before application of the succeeding coat.

b. Paint shall not be applied to wet surfaces or to outside surfaces when the temperature is below 40 degrees Fahrenheit.

c. Finishing coat shall be applied in time to be dry when an installation is complete.

4. INTERLOCKING MACHINES

a. Mechanical.

(1) Machine from top of latch shoe to foundation supports, including quadrants, top plates, legs, and locking frame, except finished parts, shall be painted with two coats of black. The final coat shall have sufficient quantity of durable exterior varnish to produce a good gloss.

(2) Levers including latch shoes, except the portion between lever number and handle, shall be painted with black enamel, Stock W-26. Latch handles and finished parts shall not be painted. Levers between lever number and handle shall be painted with enamel as follows:

Signal levers....................	Red
Switch and derail levers........	Black
Lock levers.....................	Blue
Traffic levers..................	Gray
* Switch and lock levers..........	Black & Blue
Movable point frog levers.......	Yellow
Master lock levers..............	Brown
Spare levers....................	White

* Upper half of colored portion of switch and lock lever shall be painted black and lower half blue.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR PAINTING SIGNAL & INTERLOCKING APPARATUS

Office of Signal Engineer
Baltimore, Md.
June 5, 1958

4. INTERLOCKING MACHINES (Cont'd.)

b. Power.

(1) Cabinet of power interlocking machine, except wood cabinet, shall have two priming coats and at least one finish coat of olive green enamel.

(2) Power interlocking machine, except cabinet, levers, and machine parts, shall be painted with one coat of green glyptal lacquer.

(3) Levers, except handles and finished parts, shall be painted with enamel to conform with color code in paragraph 4-a-(2).

5. BUNGALOWS, RELAY AND TERMINAL CASES

a. Interior of relay housings and terminal cases shall be painted with one coat of aluminum paint, Stock W-1.

b. Bungalows, and relay and terminal cases, except where attached to signal masts and signal bridges, shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer, Stock M-92, and one coat of aluminum paint, Stock W-1.

6. SIGNALS

a. General

(1) When painting signals, care should be exercised to avoid getting paint on the roundels or lenses and around shafts and bearings.

(2) When the surface of the mast is being cleaned, it must be determined if there has been sufficient loss of section of the metal in the mast, which would materially affect the strength of the mast. Arrangements must be made to replace defective masts promptly.

(3) Ladder support clamps will be loosened and moved so that the surface that was covered by the clamp can be cleaned and painted with one coat of Rust-Oleum R-769 and one coat of black bridge paint, Stock W-27. The clamp will be restored to its original location after painting.

(4) If base of mast is cracked or broken, the complete mast must be replaced.

(5) Bolts fastening the dowel mast to the cross member of a pipe bracket mast must be removed and examined to determine if the bolts are suitable for further service.

(6) Nuts on anchor bolts in all signal foundations must be removed and the anchor bolts inspected to determine if the anchor bolts are suitable for further service. Before replacing nut on anchor bolt the anchor bolt must be given a coat of No-Ox-Id "A" Special grease.

(7) At locations where the signal mast is provided with a two-piece bolted type base, the bolts must be removed to be inspected and the bottom of the mast within the limits of base examined to determine if the mast is suitable for further service.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL
& INTERLOCKING APPARATUS
Office of Signal Engineer
Baltimore, Md.
June 5, 1958

b. Backgrounds.

(1) Use scraper and wire brush to remove all rust, scale and loose paint from hoods and the face of backgrounds, than apply one coat of Rust-Oleum R-769 rust preventative damp-proof red primer. When dry examine for bright spots which indicate that scale beneath such spots has not been completely removed. Remove scale beneath such spots and re-apply R-769 red primer to affected area. After satisfactory coat of R-769 red primer has been applied and allowed to dry, apply one coat of signal flat black, Stock W-29. The R-769 red primer must be thoroughly stirred before using. To obtain best results, use the minimum quantity required and apply evenly and well brushed. In cold weather, or if used in spray gun, the R-769 red primer should be thinned with not more than 10% of Rust-Oleum R-633 thinning oil, Stock W-141, thoroughly stirred in. Turpentine or linseed oil must not be used for thinning.

c. C.P.L. Dwarf Signals.

(1) The rear of dwarf signals shall be painted with one coat of Rust-Oleum R-769 rust preventative damp-proof red primer, and one coat of aluminum paint, Stock W-1.

d. Highway Crossing Signals.

(1) Masts, ladders, platforms, mechanisms, junction boxes, and rear of lamp units shall be painted with one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of aluminum paint, Stock W-1.

(2) Cast iron crossing signs shall be painted in accordance with Drawing S-413.

7. STEEL AND IRON WORK

a. Exterior surfaces of bracket posts, signal masts, ladders and platforms, junction boxes, switch circuit controllers, power switch machines, electric switch locks, and train control inductors shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of black bridge paint, Stock W-27.

b. Lids of battery boxes shall be given one coat of Rust-Oleum R-769 rust preventative damp-proof red primer and one coat of aluminum paint, Stock W-1.

8. AERIAL CABLE

a. Braided aerial cable shall be painted each five years except where inspection discloses that more frequent painting is desirable. Under exceptionally adverse conditions special paint and painting may be required. In such instances and where it is desirable to paint more often than each five years, approval of the Signal Engineer must be secured in each instance.

b. All surfaces to be painted shall be completely covered with a uniform coat. Tape coverings, cable connections, repairs, etc., shall be given especially careful consideration to assure complete and thorough protection.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL
& INTERLOCKING APPARATUS
Office of Signal Engineer
Baltimore, Md.
June 5, 1958

8. AERIAL CABLE (Cont'd.)

c. Cable paint applied to built-up cable shall be thoroughly worked into all interstices between the conductors.

d. Where more than one coat of cable paint is required, the previous coat shall be allowed to become dry before the next coat is applied.

e. Painting of wires and cables shall not be done when outside temperatures are 45 degrees Fahrenheit or lower.

f. Only the following approved products may be used for painting aerial braided cable:

Collins Cablekote No. 3
D.M.C. Cable Paint
Victolac No. 12

9. TRACK

a. Base and derailing member of sliding or hinged derails shall be painted with red signal enamel, Stock W-122.

Approved: R Riley
Chief Engineer
Construction & Maintenance

Approved: A L Jordan
Signal Engineer

Issued - 4-20-
Revised and retyped - 6-5-58

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR PAINTING SIGNAL
& INTERLOCKING APPARATUS
Office of Signal Engineer
Baltimore, Md.
June 5, 1958

ITEM	NAME	PURPOSE	ORDERING REFERENCE
1	Semaphore oil	Semaphore signals (power) Parts of interlocking machines Motor and upper clutch bearings of G.R.S. Company switch machines Switch machine bearings U.S.& S. Company (except gears, see Item 2) Switch circuit controllers Spring switch buffer, Pettibone-Mulliken Corporation.	B.& O. Stock No. 5922
2	Summer-Winter grease	G.R.S. Company Models 5A, B, C and D switch machines Cam bar, throw bar, gearing, lock and detector rods, and all parts equipped with alemite fittings. U.S.& S. Co. style M-2, M-22A and M-22B switch machine Worm gear compartment Spur gear compartment of movements not equipped with Oilite bushings (furnished prior to December 1, 1946 and serial No. 5198) Gear teeth only of movements equipped with Oilite bushings	Lubricant meeting the requirements of Army-Navy Aeronautical Specification Grease AN-G-3a-B&O Stock 5999
3	Cup grease	Apparatus equipped with alemite pressure fittings.	B.& O. Stock No. 5958
4	Relay oil	Relays, G.R.S. Company Types Clockwork time releases Other delicate apparatus	G.R.S.Company Dwg.No. 51347-10, Gr.1 (2 oz.bottles) B.&.O.Stock No.6006 (Zanesville).
5	Relay oil	Relays, U.S.& S. Company Styles Clockwork time releases Other delicate apparatus	U.S.& S. Company Pce. No. 220699 (1 oz. bottles) B. & O. Stock No. 6005 (Zanesville)

BALTIMORE & OHIO RAILROAD
GREASE AND OILS
USED BY SIGNAL DEPARTMENT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

SHEET NO. 1

I-135

ITEM	NAME	PURPOSE	ORDERING REFERENCE
6	Code Transmitter oil	Code transmitters, G.R.S. Company Types	G.R.S. Company Dwg. No. 51347-7 Gr. 1 (4 oz. containers)
7	White Petrolatum Jelly	Code transmitters, U.S.& S. Co. Styles Trunions on control machine levers of G.R.S. Co. Type B car retarders Impedance bonds "C" and "CP" valves.	B.& O. Stock No.5966
8	Car Retarder Oil	For lubricating all parts of G.R.S.Co. Type B car retarders which slide or turn with respect to each other outside the mechanism assembly.	B.&.O. Stock No.5924
9	Car Retarder Grease	For inside gear and mechanism housing - G.R.S. Co. Type B.	B.&.O. Stock No.6010
10	Brake cylinder grease	Pistons,U.S.&.S.Company Model 31 car retarder and "A-5" EP S&L movement.	(B.& O. Stock No. 5954 A.A.R.Spec. M-1914-42)
11	Pressure gun grease	Car retarder bearings, U.S.& S. Company Model 31	B.& O. Stock No. 5958-A
12	Car journal oil	Leadouts Pipe lines and connections Mechanical signals	B.& O. Stock No. 491 (for summer use) B.& O. Stock No. 492 (for winter use)
13	Motor oils	Gas engine crank cases (water cooled) Motor cars (mix with gasoline)	B.& O. Stock No. 5948 (For summer use SAE-30) B.& O. Stock No. 5950A (For winter use SAE-20)
14	Oil	For flexible shaft of mall tool grinders	B.& O. Stock No. 5991

BALTIMORE & OHIO RAILROAD
GREASE AND OILS
USED BY SIGNAL DEPARTMENT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

SHEET NO.2

ITEM	NAME	PURPOSE	ORDERING REFERENCE
15	Oil	Power bonding machines Mall tool grinders	B.& O. Stock No. 5915
16	Refrigerator oil	Generators Motors, etc.	B.& O. Stock No. 5926
17	No-Ox-Id "A" Special	Protection against corrosion	Dearborn Chemical Co.
18	Penetrating oil	Rustbound bolts and equipment	B.& O. Stock No. 5900 (Mt. Clare)
19	Preservative oil	Gauge plates Switch rods and other rods around switches, derails and MPF, etc., except insulation	B.& O. Stock No. 5943
20	Transformer oil	Transformers	B.& O. Stock No. 596
21	Carbon oil	For illumination	B.& O. Stock No. 481
22	Red Engine Oil	Slow speed machinery, shop tools, and machinery motors	B.& O. Stock No. 594

BALTIMORE & OHIO RAILROAD

GREASE AND OILS USED BY SIGNAL DEPARTMENT

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

SHEET NO. 3

ITEM	NAME	PURPOSE	ORDERING REFERENCE
23	Graphite Lubricant	For switch slide plates	B.& O. Stock No. 5160A
24	Tulc	For semaphore shaft bearings of T-2 signals	2VH Tulc - U.S.& S. Co. or Dixons Semaphore Lubricant (graphite)

APPROVED: ______________________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
GREASE AND OILS
USED BY SIGNAL DEPARTMENT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 17, 1949

SHEET NO. 4

136.0. Applicability of this part. The following rules, standards, and instructions are hereby approved and prescribed for observance by each common carrier subject to the provisions of section 25 of the Interstate Commerce Act, on and after October 1, 1950.

SUBPART A—RULES AND INSTRUCTIONS—ALL SYSTEMS

GENERAL

136.1. Plans, where kept. Track layout plan, circuit plan, and where mechanical locking is used, locking sheet and dog chart, shall be kept at each interlocking and circuit plan shall be kept at each controlled point in traffic control systems; circuit plan for each automatic signal shall be available at the headquarters of the employee directly responsible for the maintenance of such signal; copies of all of the foregoing plans, and profile plan, drawn to scale, showing locations of signals, grades and alinement, for the sections of railroad under the jurisdiction of a divisional signal supervisory officer shall be kept at his headquarters; copies of plans pertaining to signal and interlocking facilities under the jurisdiction of general, regional or system signal officers shall be kept at their offices. All plans shall be correct and legible and available for use by the Commission's representatives.

136.2. Grounds. Each circuit, the functioning of which affects safety of train operation, shall be kept free of any ground or combination of grounds which will permit a flow of current equal to or in excess of 75% of the release value of any relay or other electromagnetic device in the circuit, except circuit which includes any track rail.

136.3. Locking of instrument cases and interlocking machine cabinets. Outdoor signal and instrument cases shall be locked, except signal mechanism housings at interlockings where maintenance forces are continuously on duty. Power interlocking machine cabinets, time releases, and electric locks exposed on interlocking machines shall be locked or sealed.

136.4. Interference with normal functioning of device. The normal functioning of any device shall not be interfered with in testing or otherwise without first taking measures for insuring safety of train operation which depends on normal functioning of such device.

136.5. Design of control circuits on closed circuit principle. All control circuits, the functioning of which affects safety of train operation, shall be designed on the closed circuit principle, except circuits for roadway equipment of intermittent automatic train stop system.

136.6. Hand-operated switch equipped with swich circuit controller. Hand-operated switch equipped with switch circuit controller connected to the point, or with facing point lock and circuit controller, shall be so maintained that when point is open one-fourth inch or more on facing point switch and three-eighths inch or more on trailing point switch, track or control circuits will be opened or shunted or both, and, if equipped with facing point lock with circuit controller, switch cannot be locked. Switch circuit controllers, facing point locks and switch-and-lock movements and their connections shall be securely fastened in place, and contacts maintained with an opening of not less than one-sixteenth inch when open.

136.7. Circuit controller operated by switch-and-lock movement. Circuit controller operated by switch-and-lock movement shall be maintained so that normally open contacts will remain closed and normally closed contacts will remain open until the switch is locked.

136.8. Operating characteristics of electromagnetic apparatus. Operating characteristics of electromagnetic apparatus shall be maintained in accordance with the limits within which such apparatus is designed to operate.

136.9. Selection of circuits through indicating or annunciating instruments. Signal control and electric locking circuits shall not be selected through the contacts of instruments designed primarily for indicating or annunciating purposes in which an indicating element attached to the armature is arranged so that it can in itself cause improper operation of the armature.

NOTE: Existing installations shall be brought into conformity with the requirements of this section on or before October 1, 1952.

136.10. Electric locks, forced-drop type—where required. Electric locks on new installations and new electric locks applied to existing installations shall be of the forced-drop type.

136.11. Adjustment, repair or replacement of apparatus. Any piece of apparatus or any part thereof which fails to perform its intended function shall be promptly adjusted, repaired or replaced.

136.12. Spring switch signal protection—where required. Signal protection shall be provided for facing and trailing movements through spring switch within interlocking limits, and through spring switch hereafter installed in automatic block signal, train stop, train control or cab signal territory where train movements over the switch are made at a speed exceeding 20 miles per hour, except that signal protection shall be required only with the current of traffic on track signaled for movement in only one direction.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier.

136.13. Spring switch—selection of signal control circuits through circuit controller. The control circuits of signals governing facing movements over a main track spring switch shall be selected through the contacts of a switch circuit controller, or through the contacts of relay repeating the position of such circuit controller, which, when normally closed switch point is open one-fourth inch or more, will cause such signals to display their most restrictive aspects, except that where a separate aspect is displayed for facing movements over the switch in the reverse position the signal shall display its most restrictive aspect when the switch points are open one-fourth inch or more from either the normal or reverse position.

136.14. Spring switch signal protection—requirements.

(a) The indication of signal governing movements from siding to main track with the current of traffic on track signaled for movements in only one direction through a spring switch in automatic block signal territory shall be not less restrictive than "Proceed at Restricted Speed" when the block, into which movements are governed by the signal, is occupied, and shall be "Stop" when the main track is occupied by a train approaching the switch within at least 1500 feet in approach of the approach signal located stopping distance from the main track signal governing trailing movements over switch, except that the indication may be caused to be less restrictive if approach or time locking is used.

(b) The indication of signal governing movements against the current of traffic from the reverse main of main tracks to a single track, or signal governing movements from a siding to a main track signaled for movements in either direction, through a spring switch, in automatic block signal territory, shall be not less restrictive than "Proceed at Restricted Speed" when the block, into which movements are governed by the signal, is occupied by a preceding train, and shall be "Stop" when the block on the single track into which the signal governs is occupied by an opposing train.

(c) The indication of signal governing movements against the current of traffic from the reverse main of main tracks to a single track or signal governing movements from a siding to a main track signaled for movements in either direction through a spring switch in automatic block signal territory shall be "Stop" when the normal direction main track of the double track or the single track signaled for movements in both directions is occupied by a train approaching the switch within at least 1500 feet in approach of the approach signal located stopping distance from the main track signal governing trailing movements over switch, except that indication may be caused to be less restrictive if approach or time locking is used.

NOTE: Existing installations shall be brought into conformity with the requirements of this section on or before October 1, 1952. As to existing installations, relief from the requirements of this section will be granted upon an adequate showing by an individual carrier.

BALTIMORE AND OHIO RAILROAD

I.C.C. RULES, STANDARDS AND INSTRUCTIONS

EFFECTIVE OCTOBER 1st, 1950

136.15. Timetable instructions. Automatic block, traffic control, train stop, train control and cab signal territory shall be designated in timetable instructions.

Roadway Signals and Cab Signals

136.21. Location of roadway signals. Each roadway signal hereafter installed shall be located over or to the right of the track it governs.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

136.22. Semaphore signal arm—clearance to other objects. At least one-half inch clearance shall be provided between semaphore signal arm, and any object that may interfere with its operation.

136.23. Aspects and indications. Aspects shall be shown by the position of semaphore blades, color of lights, position of lights, flashing of lights, or any combination thereof. They may be qualified by marker plate, number plate, letter plate, marker light, shape and color of semaphore blades or any combination thereof, subject to the folowing conditions:

> Night aspects of roadway signals, except qualifying appurtenances, shall be shown by lights; day aspects by lights or semaphore arms. A single white light shall not be used.
>
> Reflector lenses or buttons or other devices which depend for visibility upon reflected light from an external source shall not be used in night aspects, except qualifying appurtenances.

The aspects of cab signals shall be shown by lights or by illuminated letters.

Each aspect displayed by a signal shall be identified by a name and shall indicate action to be taken. Only one name and indication shall apply to those aspects indicating the same action to be taken; the same aspect shall not be used with any other name and indication.

The fundamental indications of signal aspects shall conform to the following:

> A red light, a series of horizontal lights or a semaphore blade in a horizontal position shall be used to indicate stop.
>
> A yellow light, a lunar light, or a series of lights or a semaphore blade in the upper or lower quadrant at an angle of approximately 45 degrees to the vertical, shall be used to indicate that speed is to be restricted and stop may be required.
>
> A green light, a series of vertical lights, or a semaphore blade in a vertical position in the upper quadrant or 60° or 90° in the lower quadrant shall be used to indicate proceed at authorized speed.

The names, indications and aspects of roadway signals and cab signals shall be defined in Block Signal and Interlocking Rules in effect on each railroad subject to these Rules, Standards and Instructions. Copy of such Block Signal and Interlocking Rules shall be filed with the Interstate Commerce Commission within six months after the date of this order and copy of subsequent modifications shall be filed with said Commission within thirty days after such modifications become effective. Such rules and any modifications thereof shall remain in effect until otherwise ordered by the Commission.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier.

136.24. Spacing of roadway signals. Each roadway signal shall be located with respect to the next signal or signals in advance which govern train movements in the same direction so that the indication of a signal displaying a restrictive aspect can be complied with by means of a brake application, other than an emergency application, initiated at such signal, either by stopping at the signal where a stop is required, or by a reduction in speed to the rate prescribed by the next signal in advance where reduced speed is required.

136.25. False restrictive position of semaphore signal arm or failure of lamp in light signal. If an arm of a semaphore signal assumes a false restrictive position or if a lamp in a light signal fails the signal shall not display a less restrictive aspect than intended.

NOTE: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity therewith in accordance with the following schedule:

Not less than 20 per cent on or before October 1, 1951.
Not less than 40 percent on or before October 1, 1952.
Not less than 60 percent on or before October 1, 1953.
Not less than 80 percent on or before October 1, 1954.
The remainder on or before October 1, 1955.

136.26. Buffing device—maintenance. Buffing device shall be maintained so as not to cause the signal to display a less restrictive aspect than intended.

136.27. Phantom signal aspect. Measures shall be taken to prevent recurrence of a phantom signal aspect.

Track Circuits

136.51. Track circuit requirements. Track relay shall be in deenergized position whenever any of the following conditions exist, and the track circuit of an automatic train stop, train control, or cab signal system shall be deenergized in the rear of the point where any of the following conditions exist:

(a) When a rail is broken or a rail or switch-frog is removed except when a rail is broken or removed in the shunt fouling circuit of a turnout or crossover, provided, however, that shunt fouling circuit may not be used in a turnout, through which permissible speed is greater than 45 miles per hour. It shall not be a violation of this requirements if a track circuit is energized when a break occurs within the limits of the joint bars or rail-joint bond, or as a result of leakage current or foreign current in the rear of a point where a break occurs or a rail is removed.

(b) When a train, locomotive, or car occupies any part of a track circuit, including fouling section of turnout, except turnouts of a hand-operated main track crossover. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease or other foreign matter on the rail prevents effective shunting.

(c) Where switch shunting circuit is used:

1. Switch points are not closed in normal position.
2. A switch is not locked where facing point lock with circuit controller is used.
3. An independently operated fouling point derail equipped with switch circuit controller is not in derailing position.

136.52. Relayed cut-section. Where relayed cut-section is used in territory where noncoded direct-current track circuits are in use the energy circuit to the adjoining track shall be open and the track circuit shunted when the track relay at such cut-section is in deenergized position.

136.53. Track circuit feed at grade crossing. At grade crossing with an electric railroad where foreign current is present, the electric energy for noncoded direct current track circuit shall feed away from the crossing.

136.54. Minimum length of track circuit. The length of any track circuit, except trap circuit or special circuit not used for control of signaling facilities, shall be greater than maximum inner wheel base of any locomotive or car.

136.55. Dead section—maximum length. Where dead section exceeds 35 feet, special circuit shall be installed. Where shortest outer wheel base of a locomotive operating over such dead section is less than 35 feet, the maximum length of the dead section shall not exceed the length of the outer wheel base of such locomotive unless special circuit is used.

136.56. Shunting sensitivity. Track circuit shall be so maintained that track relay will be in deenergized position if, when track circuit is dry, a shunt of 0.06 ohm resistance is connected across the track rails of the circuit, including fouling sections of turnouts.

136.57. Shunt wires. Shunt wires and fouling wires, except shunt wires to switch circuit controller through which signal control circuits are controlled and track circuits are shunted, shall consist of at least two conductors and each shall be of sufficient conductivity and maintained in such condition that the track relay will be in deenergized position when the circuit is shunted.

NOTE: Existing installations shall be brought into conformity with the requirements of this section on or before October 1, 1952.

136.58. Turnout, fouling section. Fouling section of turnout shall extend to clearance point.

136.59. Insulated rail joints. Insulated rail joints shall be maintained in condition to prevent sufficient track circuit current from flowing between the rails separated by the insulation to cause a failure of any track circuit involved.

Wires and Cables

136.71. Signal wires on pole lines. Signal wires carried on pole lines shall be securely tied in on insulators.

136.72. Clearance of overhead signal wires and cables. Where men are permitted to be on top of cars the clear space between the lowest overhead signal line conductor and the top of track rails shall be not less than 27 feet at 60° F., no wind. The distance may be reduced to 25 feet for guys and for cables carried on messengers.

136.73. Open-wire transmission line—clearance to other circuits. Open-wire transmission line operating at voltage of 750 volts or more shall be placed not less than 4 feet about the nearest crossarm carrying signal or communication circuits.

136.74. Protection of insulated wire; splice in underground wire. Insulated wire shall be protected from mechanical injury. The insulation shall not be punctured for test purposes. Splice in underground wire shall have insulation resistance at least equal to the wire spliced.

136.75. Insulated wires and cable—supports. Insulated wires and cables used aerially shall be supported on insulators or by messengers.

136.76. Interference of wires with operating parts of mechanisms. Wires shall not interfere with operating parts of mechanisms.

136.77. Tagging of wires. Each wire shall be tagged or otherwise marked so it can be identified at each terminal. Nomenclature shall correspond to that of the circuit plan. Tags or other marks of identification in instrument cases and apparatus housings shall be made of insulating material and shall not interfere with moving parts of apparatus.

136.78. Lightning arrester. Lightning arrester shall be properly connected and ground maintained with resistance to ground preferably not more than 25 ohms.

Inspections and Tests—All Systems

136.101. Purpose of inspections and tests; removal from service of relay failing to meet test requirements. The following inspections and tests shall be made in accordance with specifications of the carrier subject to approval of the Commission to determine if the apparatus and/or equipment is maintained in condition to perform its intended function. Relay or other electromagnetic device which fails to meet the requirements of specified tests shall be removed from service, and shall not be restored to service until its operating characteristics are in accordance with the limits within which such relay or electromagnetic device is designed to operate.

136.102. Signal mechanism. Signal mechanism shall be inspected at least once every six months, and tests of the operating characteristics of all parts shall be made at least once every two years.

136.103. Switch circuit controller. Switch circuit controller shall be inspected and tested at least once every three months.

13.104. Shunt fouling circuit. Shunt fouling circuit shall be inspected and tested at least once every three months.

136.105. Electric lock. Electric lock, except forced-drop type, shall be tested at least once every two years.

136.106. Relays. Relay in service, except locomotive relay, shall be tested at least once every two years.

136.107. Lightning arresters. Gas and vacuum type lightning arresters shall be tested at least once a year.

136.108. Insulation resistance tests. Insulation resistance tests shall be made when wires, cables, and insulation are dry. Wires and cables, except wires connected directly to track rails, shall be tested in accordance with the following schedule. Conductors shall be promptly repaired or renewed when insulation resistance is below the following values:

Description	Period	Mimimum Allowance resistance
Low voltage (660 volts or less) wires and cables with insulation and protective outer covering not specifically designed for underground use, any part of which is underground or in trunking.	5 years	1 megohm.
Low voltage (660 volts or less) wires and cables with insulation and protective outer covering not specifically designed for underground use, no part of which is underground or in trunking.	8 years	1 megohm.
Low voltage (660 volts or less) wires and cables with insulation and protective outer covering designed specifically for underground use, or in underground conduit, or as submarine cables.	8 years	1 megohm.
Local signal wiring.	8 years	1 megohm.
Lead covered signal power cable.	8 years	100 megohms between sectionalizing switches.
Underground signal power lines not lead sheathed.	5 years	40 megohms for voltages up to and including 660 volts for section tested. 100 megohms between sectionalizing switches for voltages exceeding 660.

136.109. Records of results of tests; forms for keeping records; where filed. Results of tests made in compliance with 136.102 to 136.108, inclusive, 136.376 to 136.387, inclusive, and 136.576, 136.577, 136.586, 136.588, and 136.589 shall be recorded on forms provided by the railroad. Such forms shall show name of railroad, place and date, equipment tested, repairs, replacements, adjustments made, and condition in which apparatus was left, and signature of employee making the test. Each form shall be filed in the office of a divisional officer of the division on which the tests were made.

SUBPART B—AUTOMATIC BLOCK SIGNAL SYSTEMS

Standards

136.201. Track circuit control of signals. Signals shall be controlled automatically by track circuits extending through the entire block.

136.202. Signal governing movements over hand-operated switch. Signal governing movements over hand-operated switch in the facing direction shall display its most restrictive aspect when the points are open one-fourth inch or more and, in the trailing direction, three-eights inch or more, except that where a separate aspect is displayed for facing movements over the switch in the normal and in the reverse position, the signal shall display its most restrictive aspect when the switch points are open one-fourth inch or more from either the normal or reverse position.

136.203. Hand-operated crossover between main tracks—protection. At hand-operated crossover between main tracks protection shall be provided by one of the following: (1) An arrangement of one or more track circuits and switch circuit controllers, (2) facing point locks on both switches of the crossover, with both locks operated by a single lever, or (3) electric locking of the switches of the crossover. Signals governing movements over either switch shall display their most restrictive aspect when any of the following conditions exist:

(a) Where protection is provided by one or more track circuits and switch circuit controllers, and either switch is open or the crossover is occupied by a train, locomotive or car in such a manner as to foul the main track. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease or other foreign matter on the rail prevents effective shunting;

(b) Where facing point locks with a single lever are provided, and either switch is unlocked;

(c) Where the switches are electrically locked, before the electric locking releases.

136.204. Track signaled for movements in both directions—requirements. On track signaled for movements in both directions, a train shall cause one or more opposing signals immediately ahead of it to display an aspect requiring a stop. On such track signals shall be so arranged and controlled that if opposing trains can simultaneously pass signals displaying proceed aspects, and the next signal in advance of each such signal then displays an aspect requiring a stop, the distance between opposing signals requiring a stop shall be not less than the aggregate of the stopping distances for movements in each direction. Where such opposing signals are spaced stopping distance apart for movements in one direction only, signals arranged to display restrictive aspects shall be provided in approach to at least one of the signals. Where such opposing signals are spaced less than stopping distance apart for movements in one direction, signals arranged to display restrictive aspects shall be provided in approach to both such signals.

NOTE: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity therewith in accordance with the following schedule:

Not less than 20 percent on or before October 1, 1951.
Not less than 40 percent on or before October 1, 1952.
Not less than 60 percent on or before October 1, 1953.
Not less than 80 percent on or before October 1, 1954.
The remainder on or before October 1, 1955.

136.205. Signal control circuits—requirements. The circuits shall be so installed that each signal governing train movements into a block will display its most restrictive aspect when any of the following conditions obtain within the block; (1) occupancy by a train, locomotive,or car, (2) when points of a switch are not closed in proper position, (3) when an independently operated fouling point derail equipped with a switch circuit controller is not in derailing position, (4) when a track relay is in deenergized position; or when signal control circuit is deenergized.

136.206. Battery or power supply with respect to relay—location. The battery or power supply for each signal control relay circuit, where an open-wire circuit or a common return circuit is used, shall be located at the end of the circuit farthest from the relay.

136.207. Electric lock on hand-operated switch—control. Electric lock on hand-operated switch shall be controlled so that it cannot be unlocked until control circuits of signals protecting such switch have been opened. Approach or time locking shall be provided.

SUBPART C—INTERLOCKING

Standards

136.301. Where signals shall be provided. Signals shall be provided to govern the train movements into and through interlocking limits.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. (See also Note 1 following 136.302).

136.302. Track circuits and route locking. Track circuits and route locking shall be provided throughout interlocking limits. (See Note 1, and with respect to route locking only, also Note 2).

NOTE 1: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

NOTE 2: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity therewith in accordance with the following schedule:

Not less than 20 per cent on or before October 1, 1951.
Not less than 40 percent on or before October 1, 1952.
Not less than 60 percent on or before October 1, 1953.
Not less than 80 percent on or before October 1, 1954.
The remainder on or before October 1, 1955.

136.303. Control circuits for signals—selection through circuit controller operated by switch points or by switch locking mechanism. The control circuit for power-operated or slotted mechanical signal governing movements at higher than restricted speed in the facing direction over switches, movable-point frogs and derails shall be selected through circuit controller operated directly by switch points or by switch locking mechanism, or through relay controlled by such circuit controller, for each facing point switch, movable-point frog and derail in the routes governed by such signal. Circuits shall be arranged so that such signal can display an aspect to proceed only when each such switch, movable-point frog and derail in the route is in proper position. Such power-operated signals hereafter installed shall be controlled in this manner through circuit controllers or switch repeating relays for all switches, movable-point frogs and derails in the routes governed by such signals.

NOTE: Existing installation shall be brought into conformity with the requirements of this section on or before October 1, 1952.

136.304. Mechanical locking or same protection effected by circuits. Mechanical locking, or the same protection effected by means of circuits, shall be provided.

136.305. Approach or time locking. Approach or time locking shall be provided in connection with signals governing movements at higher than restricted speed.

136.306. Facing point lock or switch-and-lock movement. Facing point lock or switch-and-lock movement shall be provided for mechanically operated switch, movable-point frog, or split-point derail.

136.307. Indication locking. Indication locking shall be provided for operative approach signals of the semaphore type, power-operated home signals, power-operated switches, movable-point frogs and derails, and for all approach signals hereafter installed, except light signals, all aspects of which are controlled by coded track circuits or by double-wire line circuits.

136.308. Mechanical or electric locking or electric circuits—requisites. Mechanical or electric locking or electric circuits shall be installed to prevent signals from displaying aspects which permit conflicting movements except that opposing signals may display an aspect indicating proceed at restricted speed at the same time on a track used for switching movements only, by one train at a time. Manual interlocking in service as of the date of this order at which opposing signals on the same track are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, may be continued, provided that simultaneous train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.

NOTE: Relief from the requirement of this section will be granted upon an adequate showing by an individual carrier to allow opposing signals on the same track simultaneously to display aspects to proceed through an interlocking which is unattended, provided that train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted at the same time.

136.309. Loss of shunt at automatic interlocking. At automatic interlocking, a loss of shunt of 5 seconds or less shall not permit an established route to be changed.

NOTE: Existing installations shall be brought into conformity with the requirements of this section on or before October 1, 1952.

136.310. Signal governing approach to home signal. A signal shall be provided on main track to govern the approach with the current of traffic to any home signal except where the home signal is the first signal encountered when leaving yards or stations and authorized speed approaching such signal is not higher than slow speed. When authorized speed between home signals on route governed is 20 miles per hour or less, an inoperative signal displaying an aspect indicating "Approach Next Signal Prepared to Stop" may be used to govern the approach to the home signal.

136.311. Signal control circuits, selection through track relays and through signal mechanism contacts and time releases at automatic interlocking. The control circuits for aspects with indications more favorable than "Proceed at Restricted Speed" shall be selected through track relays for all track circuits in the route governed or through repeating relays for such track relays. At automatic interlocking, signal control circuit shall be selected (1) through track relays for all track circuits in the route governed and in all conflicting routes within interlocking limits or through repeating relays for such track relays; (2) through signal mechanism contacts or relay contacts closed when signals for such conflicting routes display stop aspects; and (3) through normal contacts of time releases for such conflicting routes or contacts of relays repeating the normal position of contacts of such time releases.

136.312. Movable bridge—interlocking of signal appliances with bridge devices. When movable bridge is protected by interlocking the signal appliances shall be so interlocked with bridge devices that before a signal governing movements over the bridge can display an aspect to proceed the bridge and track must be alined and locked, with the bridge locking members within one inch of their proper positions and with the track rail on the movable span within three-eighths inch of correct surface and alinement with the rail on the bridge abutment or fixed span.

136.313. Pipe or operating connections—requirements. Steel or wrought-iron pipe one inch or larger, or members of equal strength shall be used for operating connections for switches, derails, movable-point frogs, facing point locks, rail-locking devices of movable bridge protected by interlocking, and mechanically operated signals, except up-and-down rod which may be three-fourths inch pipe or solid rod. Pipes shall be fully screwed into coupling and both ends of each pipe shall be riveted to pipe plug with 2 rivets. Pipe line shall not be out of alinement sufficiently to interfere with the proper operation of the interlocking, shall be properly compensated for temperature changes, and supported on carriers spaced not more than 8 feet apart on tangent and curve of less than 2° and not more than 7 feet apart on curve of 2° or more. With lever in any position, couplings in pipe line shall not foul carriers. (With respect to requirement for double rivets, see note.)

NOTE: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity therewith in accordance with the following schedule:

Not less than 20 per cent on or before October 1, 1951.
Not less than 40 percent on or before October 1, 1952.
Not less than 60 percent on or before October 1, 1953.
Not less than 80 percent on or before October 1, 1954.
The remainder on or before October 1, 1955.

136.314. Electric lock for hand-operated switch or derail. Electric lock shall be provided for each hand-operated switch or derail within interlocking limits, except where train movements are made at not exceeding 20 miles per hour. At manually operated interlocking it shall be controlled by operator of the machine and shall be unlocked only after signals governing movements over such switch or derail display aspects indicating stop. Approach or time locking shall be provided.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

Rules and Instructions

136.326. Mechanical locking removed or disarranged—requirement for permitting train movements through interlocking. When mechanical locking of interlocking machine is being changed or is removed from the machine, or locking becomes disarranged or broken, unless protection equivalent to mechanical locking is provided by electric locking or electric circuits, train movements through the interlocking shall not be permitted until each switch, movable-point frog or derail in the route is spiked, clamped or blocked in proper position so that it cannot be moved by its controlling lever, and then train movements shall not exceed restricted speed until the interlocking is restored to normal operation. It will not be necessary to comply with this requirement at interlockings where protection is in service in accordance with section 303, provided that the signal controls are arranged so that the signals can not display an aspect the indication of which is less restrictive than "Proceed at Restricted Speed."

136.327. Switch, movable-point frog or split-point derail. Switch, movable-point frog or split-point derail shall be maintained so that it cannot be locked if the switch point is prevented by an obstruction from closing to within three-eighths inch.

136.328. Plunger of facing point lock. Plunger of facing point lock shall have at least 8-inch stroke. When lever is in reverse position plunger shall pass through lock rod one-half inch or more.

136.329. Bolt lock. Bolt lock shall be so maintained that signal governing movements over switch or derail and displaying an aspect indicating stop cannot be operated to display a less restrictive aspect while derail is in derailing position, or when switch point is open one-half inch or more.

136.330. Locking dog of switch-and-lock movement. Locking dog of switch-and-lock movement shall extend through lock rod one-half inch or more in either normal or reverse position.

136.306. Facing point lock or switch-and-lock movement. Facing point lock or switch-and-lock movement shall be provided for mechanically operated switch, movable-point frog, or split-point derail.

136.307. Indication locking. Indication locking shall be provided for operative approach signals of the semaphore type, power-operated home signals, power-operated switches, movable-point frogs and derails, and for all approach signals hereafter installed, except light signals, all aspects of which are controlled by coded track circuits or by double-wire line circuits.

136.308. Mechanical or electric locking or electric circuits—requisites. Mechanical or electric locking or electric circuits shall be installed to prevent signals from displaying aspects which permit conflicting movements except that opposing signals may display an aspect indicating proceed at restricted speed at the same time on a track used for switching movements only, by one train at a time. Manual interlocking in service as of the date of this order at which opposing signals on the same track are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, may be continued, provided that simultaneous train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.

NOTE: Relief from the requirement of this section will be granted upon an adequate showing by an individual carrier to allow opposing signals on the same track simultaneously to display aspects to proceed through an interlocking which is unattended, provided that train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted at the same time.

136.309. Loss of shunt at automatic interlocking. At automatic interlocking, a loss of shunt of 5 seconds or less shall not permit an established route to be changed.

NOTE: Existing installations shall be brought into conformity with the requirements of this section on or before October 1, 1952.

136.310. Signal governing approach to home signal. A signal shall be provided on main track to govern the approach with the current of traffic to any home signal except where the home signal is the first signal encountered when leaving yards or stations and authorized speed approaching such signal is not higher than slow speed. When authorized speed between home signals on route governed is 20 miles per hour or less, an inoperative signal displaying an aspect indicating "Approach Next Signal Prepared to Stop" may be used to govern the approach to the home signal.

136.311. Signal control circuits, selection through track relays and through signal mechanism contacts and time releases at automatic interlocking. The control circuits for aspects with indications more favorable than "Proceed at Restricted Speed" shall be selected through track relays for all track circuits in the route governed or through repeating relays for such track relays. At automatic interlocking, signal control circuit shall be selected (1) through track relays for all track circuits in the route governed and in all conflicting routes within interlocking limits or through repeating relays for such track relays; (2) through signal mechanism contacts or relay contacts closed when signals for such conflicting routes display stop aspects; and (3) through normal contacts of time releases for such conflicting routes or contacts of relays repeating the normal position of contacts of such time releases.

136.312. Movable bridge—interlocking of signal appliances with bridge devices. When movable bridge is protected by interlocking the signal appliances shall be so interlocked with bridge devices that before a signal governing movements over the bridge can display an aspect to proceed the bridge and track must be alined and locked, with the bridge locking members within one inch of their proper positions and with the track rail on the movable span within three-eighths inch of correct surface and alinement with the rail on the bridge abutment or fixed span.

136.313. Pipe or operating connections—requirements. Steel or wrought-iron pipe one inch or larger, or members of equal strength shall be used for operating connections for switches, derails, movable-point frogs, facing point locks, rail-locking devices of movable bridge protected by interlocking, and mechanically operated signals, except up-and-down rod which may be three-fourths inch pipe or solid rod. Pipes shall be fully screwed into coupling and both ends of each pipe shall be riveted to pipe plug with 2 rivets. Pipe line shall not be out of alinement sufficiently to interfere with the proper operation of the interlocking, shall be properly compensated for temperature changes, and supported on carriers spaced not more than 8 feet apart on tangent and curve of less than 2° and not more than 7 feet apart on curve of 2° or more. With lever in any position, couplings in pipe line shall not foul carriers. (With respect to requirement for double rivets, see note.)

NOTE: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity therewith in accordance with the following schedule:

Not less than 20 per cent on or before October 1, 1951.
Not less than 40 percent on or before October 1, 1952.
Not less than 60 percent on or before October 1, 1953.
Not less than 80 percent on or before October 1, 1954.
The remainder on or before October 1, 1955.

136.314. Electric lock for hand-operated switch or derail. Electric lock shall be provided for each hand-operated switch or derail within interlocking limits, except where train movements are made at not exceeding 20 miles per hour. At manually operated interlocking it shall be controlled by operator of the machine and shall be unlocked only after signals governing movements over such switch or derail display aspects indicating stop. Approach or time locking shall be provided.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

Rules and Instructions

136.326. Mechanical locking removed or disarranged—requirement for permitting train movements through interlocking. When mechanical locking of interlocking machine is being changed or is removed from the machine, or locking becomes disarranged or broken, unless protection equivalent to mechanical locking is provided by electric locking or electric circuits, train movements through the interlocking shall not be permitted until each switch, movable-point frog or derail in the route is spiked, clamped or blocked in proper position so that it cannot be moved by its controlling lever, and then train movements shall not exceed restricted speed until the interlocking is restored to normal operation. It will not be necessary to comply with this requirement at interlockings where protection is in service in accordance with section 303, provided that the signal controls are arranged so that the signals can not display an aspect the indication of which is less restrictive than "Proceed at Restricted Speed."

136.327. Switch, movable-point frog or split-point derail. Switch, movable-point frog or split-point derail shall be maintained so that it cannot be locked if the switch point is prevented by an obstruction from closing to within three-eighths inch.

136.328. Plunger of facing point lock. Plunger of facing point lock shall have at least 8-inch stroke. When lever is in reverse position plunger shall pass through lock rod one-half inch or more.

136.329. Bolt lock. Bolt lock shall be so maintained that signal governing movements over switch or derail and displaying an aspect indicating stop cannot be operated to display a less restrictive aspect while derail is in derailing position, or when switch point is open one-half inch or more.

136.330. Locking dog of switch-and-lock movement. Locking dog of switch-and-lock movement shall extend through lock rod one-half inch or more in either normal or reverse position.

136.331. Repairs to switch and signal valves and cylinders. Repairs to switch and signal valves and cylinders shall not be made while they are in service.

136.332. Air distribution system—draining condensation. Provision shall be made for draining condensation out of air distribution system at low points. Condensers, tanks, reservoirs, and air distribution lines shall be drained frequently enough to avoid overflow of condensation into branch lines and apparatus.

136.333. Pole changer on electric switch operating mechanism. Pole changer on electric switch operating mechanism shall be maintained so that movement of switch mechanism follows movement of controlling lever.

136.334. Point detector. Point detector shall be maintained so that when switch mechanism is locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point. Point detector circuit controller shall be maintained so that the contacts will not assume the position corresponding to switch point closure if the switch point is prevented by an obstruction, from closing to within one-fourth inch where latch-out device is not used, and to within three-eighths inch where latch-out device is used.

136.335. Dogs, stops and trunnions of mechanical locking. Driving pieces, dogs, stops and trunnions shall be rigidly secured to locking bars. Swing dogs shall have full and free movement. Top plates shall be maintained securely in place.

136.336. Locking bed. The various parts of the locking bed, locking bed supports, and tappet stop rail shall be rigidly secured in place and alined to permit free operation of locking.

136.337. Locking faces of mechanical locking—fit. Locking faces shall fit squarely against each other with a minimum engagement when locked of at least one-half the designed locking face.

136.338. Mechanical locking required in accordance with locking sheet and dog chart. Mechanical locking shall be in accordance with locking sheet and dog chart currently in effect.

136.339. Mechanical locking—maintenance requirements. Locking and connections shall be maintained so that, when a lever or latch is mechanically locked, the following will be prevented:

(a) Mechanical machine.

1. Latch-operated locking. Raising lever latch block so that bottom thereof is within three-eights inch of top of quadrant.
2. Lever operated locking. Moving lever latch block more than three-eighths inch on top of quadrant.

(b) Electro-mechanical machine.

1. Lever moving in horizontal plane. Moving lever more than three-sixteenths inch when in normal position or more than seven-sixteenths inch when in reverse position.
2. Lever moving in arc. Moving lever more than 5°.

(c) Power machine.

1. Latch operated locking. Raising lever latch block so that bottom thereof is within seven thirty-seconds inch of top of quadrant.
2. Lever moving in horizontal plane. Moving lever more than five-sixteenths inch when in normal position or more than nine-sixteenths inch when in reverse position.
3. Lever moving in arc. Moving lever more than 5°.

136.340. Electro-mechanical interlocking machine—locking between electrical and mechanical levers. In electro-mechanical interlocking machine, locking between electric and mechanical levers shall be maintained so that mechanical lever cannot be operated except when released by electric lever.

136.341. Latch shoes, rocker links, and quadrants. Latch shoes, rocker links, and quadrants of Saxby and Farmer machines shall be maintained so that locking will not release if a downward force not exceeding a man's weight is exerted on the rocker while the lever is in mid-stroke position.

136.342. Switch circuit controller. Switch circuit controller connected at the point to switch, derail, or movable-point frog, shall be maintained so that its contacts will not be in position corresponding to switch point closure when switch point is open one-fourth inch or more.

Inspection and Tests

136.376. Mechanical locking. Mechanical locking in interlocking machine shall be tested when new locking is placed in service or change in locking is made. Complete test shall be made at least once every 4 years.

136.377. Approach locking. Approach locking shall be tested at least once a year.

136.378. Time locking. Time locking shall be tested at least once a year.

136.379. Route locking. Route or other type of switch locking shall be tested at least once every three months.

136.380. Indication locking. Indication locking for semaphore signals and for switch or lock levers shall be tested at least one a year and for light signals at least once every two years.

136.381. Traffic locking. Traffic locking shall be tested at least once a year.

136.382. Switch obstruction test. Switch obstruction test shall be made at least once a month.

136.383. Valve locks and valve magnets. Valve locks on valves of the non-cut-off type, valves, and valve magnets shall be tested at least once every three months.

136.384. Cross protection. Cross protection shall be tested at least once every three months.

136.385. Time releases and timing relays. Time releases and timing relays shall be tested at least once every three months. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release or relay.

136.386. Restoring feature on power switches. Restoring feature on power switches shall be tested at least once every three months.

136.387. Movable bridge locking. Movable bridge locking shall be tested at least once a year.

SUBPART D—TRAFFIC CONTROL SYSTEMS

Standards

136.401. Automatic block signal system and interlocking standards applicable to traffic control systems. The standards prescribed in 136.201 to 136.203, inclusive, 136.205, 136.206, 136.303, 136.307, 136.310 and 136. 311 shall apply to traffic control systems.

136.402. Signal control—track circuit and control operator. Signal governing movement at higher than restricted speed shall be controlled by continuous track circuits. Also, in addition, at controlled point they shall be controlled by control operator, and, at manually operated interlocking, manually in cooperation with control operator.

136.403. Signals at controlled point. Signals at a controlled point shall be so interconnected that aspects to proceed cannot be displayed simultaneously for conflicting movements.

136.404. Signals at adjacent controlled points. Signals at adjacent controlled points shall be so interconnected that aspects to proceed cannot be displayed simultaneously for conflicting movements.

136.405. Track signaled for movement in both directions—change of direction of traffic. On track signaled for movements in both directions, occupancy of the track between opposing signals at adjacent controlled points shall prevent changing the direction of traffic from that which obtained at the time the track became occupied.

136.406. Indication of track circuit occupancy at controlled points. Occupancy of track circuits at controlled points shall be automatically indicated at the control station.

136.407. Approach or time locking—where required. Approach or time locking shall be provided for all controlled signals and for all electric locks on hand-operated switches.

136.408. Route locking. Route locking shall be provided where switches are power operated.

136.409. Control machine—indication of switch operation. It shall be indicated on the control machine when power-operated switch has completed its movement and is locked.

136.410. Hand-operated switch electrically locked. Each hand-operated switch hereafter installed in main track where train movements are made at speeds exceeding 20 miles per hour shall be electrically locked in normal position. Electric lock may be unlocked either automatically or by the control operator, but only after control circuits of signals governing movements over the switch in each direction have been opened.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

Rules and Instructions

136.426. Interlocking Rules and Instructions applicable to Traffic Control Systems. The rules and instructions prescribed in 136.327 and 136.328, 136.330 to 136.334, inclusive, and 136.342 shall apply to traffic control systems.

Inspection and Tests

136.476. Interlocking Inspections and Tests applicable to Traffic Control Systems. The inspections and tests prescribed in 136.777 to 136.380, inclusive, and 136.382, 136.383, 136.385, and 136.386 shall apply to traffic control systems.

SUBPART E—AUTOMATIC TRAIN STOP, TRAIN CONTROL AND CAB SIGNAL SYSTEMS

Standards

136.501. Forestalling device and speed control.

(a) An automatic train stop system may include a device by means of which the automatic application of the brakes can be forestalled.

(b) Automatic train control system shall include one or more of the following features:

1. Low-speed restriction, requiring the train to proceed under slow speed after it has either been stopped by an automatic application of the brakes, or under control of the engineman, its speed has been reduced to slow speed, until the apparatus is automatically restored to normal because the condition which caused the restriction no longer affects the movement of the train.
2. Medium-speed, restriction, requiring the train to proceed under medium speed after passing a signal displaying an approach aspect or when approaching a signal requiring a stop, or a stop indication point, in order to prevent an automatic application of the brakes.

NOTE: Relief from the requirements of sub-paragraphs (1) and (2) of this paragraph will be granted, insofar as speed limits fixed by definitions of Slow and Medium speeds are concerned, upon an adequate showing by an individual carrier where automatic train control systems now in service enforce speed restrictions higher than those required by definitions in 136.700 to 136.838, inclusive.

3. Maximum-speed restriction, effecting an automatic brake application whenever the predetermined maximum speed limit is exceeded.

136.502. Automatic brake application—initiation by restrictive block conditions stopping distance in advance. An automatic train stop or train control system shall operate to initiate an automatic brake application at least stopping distance from the entrance to a block, wherein any condition described in 136.205 obtains, and at each signal requiring a reduction in speed.

136.503. Automatic brake application—initiation when predetermined rate of speed exceeded. An automatic train control system shall operate to initiate an automatic brake application when the speed of the train exceeds the predetermined rate as required by the setting of the speed control mechanism.

136.504. Operation interconnected with automatic block signal system. An automatic train stop or train control system shall operate in connection with an automatic block signal system and shall be so interconnected with the signal system as to perform its intended function in event of failure of the engineman to obey a signal requiring a reduction in speed.

136.505. Proper operative relation between parts along roadway and parts on locomotive. Proper operative relation between the parts along the roadway and the parts on the locomotive shall obtain under all conditions of speed, weather, wear, oscillation, and shock.

136.506. Release of brakes after automatic application. The automatic train stop or train control apparatus shall prevent release of the brakes after automatic application until a reset device has been operated, or the speed of the train has been reduced to a predetermined rate, or the condition that caused the brake application no longer affects the movement of the train. If reset device is used it shall be arranged so that the brakes cannot be released until the train has been stopped, or it shall be located so that it cannot be operated by engineman without leaving his accustomed position in the cab.

136.507. Brake application—full service. The automatic train stop or train control apparatus shall, when operated, cause a full service application of the brakes.

136.508. Interference with application of brakes by means of brake valve. The automatic train stop, train control or cab signal apparatus shall be arranged so as not to interfere with the application of the brakes by means of the brake valves and not to impair the efficiency of the air brake system.

136.509. Two or more locomotives coupled. The automatic train stop, train control or cab signal apparatus shall be arranged so that when two or more locomotives are coupled, or a pushing or helping locomotive is used, it can be made operative only on the locomotive from which the brakes are controlled.

136.510. Conformance with established clearances. The automatic train stop, train control and cab signal apparatus shall be arranged so as to conform to carriers' established clearances for equipment and structures.

136.511. Cab signals controlled in accordance with block conditions stopping distance in advance. The automatic cab signal system shall be arranged so that cab signals will be continuously controlled in accordance with conditions described in 136.205 that obtain at least stopping distance in advance.

136.512. Cab signal indication when locomotive enters block where restrictive conditions obtain. The automatic cab signal system shall be arranged so that when a locomotive enters or is within a block, wherein any condition described in 136.205 obtains, the cab signals shall indicate "Proceed at Restricted Speed."

136.513. Audible indicator. The automatic cab signal system shall be arranged so that when the cab signal changes to display a more restrictive aspect, an audible indicator will sound continuously until silenced by manual operation of an acknowledging device.

136.514. Interconnection of cab signal system with roadway-signal system. The automatic cab signal system shall be interconnected with the roadway-signal system so that the cab signal indication will not authorize operation of the train at a speed higher than that authorized by the indication of the roadway-signal that governed the movement of a train into a block except when conditions affecting movement of trains in the block change after the train passes the signal.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

136.515. Visibility of cab signals. The cab signals shall be plainly visible to members of the locomotive crew from their stations in the cab.

136.516. Cab indicator—requirements. The cab indicator shall have a distinctive sound which will be clearly audible throughout the cab under all operating conditions.

Rules and Instructions—Roadway

136.526. Roadway element not functioning properly. When a roadway element except track circuit of automatic train stop, train control or cab signal system is not functioning as intended, the signal associated with such roadway element shall be caused manually to display its most restrictive aspect until such element has been restored to normal operative condition.

136.527. Roadway element insulation resistance. Insulation resistance between roadway inductor or magnet winding and ground shall be maintained at not less than 10,000 ohms.

136.528. Restrictive condition resulting from open hand-operated switch—requirement. When a facing point hand-operated switch is open one-fourth inch or more, or a trailing point hand-operated switch three-eights inch or more, or hand-operated switch is not locked where facing point lock with circuit controller is used, the resultant restrictive condition of an automatic train stop or train control device of the continuous type or the resultant restrictive cab signal indication of an automatic cab signal device on an approaching locomotive shall be maintained to within 300 feet of the points of the switch.

136.529. Roadway element inductor—height and distance from rail. Inductor of the inert roadway element type shall be maintained with the inductor pole faces at a height above the plane of the tops of the rails, and with its inner edge at a horizontal distance from the gage side of the nearest running rail, in accordance with specifications of the carrier on file with the Commission.

136.530. Ramp—height and distance from rail. Ramp of automatic train stop device shall be maintained with its contact surface at its highest point at a height above the plane of the tops of the rails, and with its center line at a horizontal distance from the gage side of the nearest running rail, in accordance with specifications of the carrier on file with the Commission.

136.531. Trip arm—height and distance from rail. Trip arm of automatic train stop device when in stop position shall be maintained at a height above the plane of the tops of the rails, and at a horizontal distance from its center line to gage side of the running rail, in accordance with specifications of the carrier on file with the Commission.

136.532. Strap iron inductor—use restricted. No railroad shall use strap iron inductor, short ramp, or other roadway element with characteristics differing from its standard type, on track where speed higher than restricted speed is permitted.

136.533. Track magnet—height. Track magnet located between the rails of a track shall not extend above the plane of the tops of the rails.

136.534. Entrance to equipped territory—requirements. Where trains are not required to stop at the entrance to equipped territory, except when leaving yards and stations and speed until entering equipped territory does not exceed restricted speed, the automatic train stop, train control, or cab signal device shall be operative at least stopping distance from the entrance to such territory except where the approach thereto is governed by automatic approach signal.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier.

Rules and Instructions—Locomotives

136.551. Power supply voltage—requirement. The voltage of power supply shall be maintained within 10 percent of rated voltage.

136.552. Insulation resistance—requirement. Insulation resistance between wiring and ground shall be not less than the following:

Continuous inductive automatic train stop, train control, and cab signal systems—250,000 ohms.

Intermittent inductive automatic train stop systems —20,000 ohms.

136.553. Seal or lock—where required. Seal or lock shall be maintained on any device, other than the double heading cock, by means of which operation of the pneumatic portion of the apparatus can be cut out.

136.554. Rate of pressure reduction—equalizing-reservoir or brake-pipe. The equalizing reservoir-pressure or brake-pipe pressure reduction during an automatic brake application shall be at a rate not less than that which results from a manual service application.

136.555. Repaired or rewound receiver coil. Receiver coil which has been repaired or rewound shall have the same operating characteristics which it possessed originally or as currently specified for new equipment.

136.556. Adjustment of relay. Change in adjustment of relay shall be made only in a shop equipped for that purpose except when receiver coils, electro-pneumatic valve, or other essential parts of the equipment is replaced. Irregularities in power-supply voltage or other variable factors in the circuit shall not be compensated for by adjustment of the relay.

136.557. Receiver, intermittent inductive—location with respect to rail. Receiver of intermittent inductive automatic train stop device of the inert roadway element type shall be maintained with bottom of the receiver at a height above the plane of the tops of the rails, and with its outer edge at a horizontal distance from the gage side of the nearest rail, in accordance with specifications of the carrier on file with the Commission.

136.558. Contact shoe—location with respect to rail. Contact face of shoe of automatic train stop and train control device shall be maintained at a height above the plane of the tops of the rails, and with center line of shoe at a horizontal distance from the gage side of the nearest rail, in accordance with specifications of the carrier on file with the Commission.

136.559. Receiver, intermittent magnetic—location with respect to rail. Receiver of intermittent magnetic inductive automatic train stop device shall be maintained with lower surface of receiver at a height above the plane of the tops of the rails, in accordance with specifications of the carrier on file with the Commission.

136.560. Contact element, mechanical trip type—location with respect to rail. Contact element of automatic train stop device of the mechanical trip type shall be maintained at a height above the plane of the tops of the rails, and at a horizontal distance from the gage side of the rail, in accordance with specifications of the carrier on file with the Commission.

136.561. Safety chain or safety hanger. Safety chain or safety hanger provided for receiver of continuous inductive automatic train stop, train control or cab signal device shall clear receiver core one inch or more.

136.562. Minimum rail current required. The minimum rail current required to restore the locomotive equipment of continuous inductive automatic train stop or train control device to normal condition or to obtain a proceed indication of automatic cab signal device (pick-up) shall be in accordance with specifications of the carrier on file with the Commission.

136.563. Delay time. Delay time of automatic train stop or train control system shall not exceed 8 seconds and the spacing of signals to meet the requirements of 136.24 shall take into consideration the delay time.

136.564. Acknowledging time. Acknowledging time of intermittent automatic train stop device shall be not more than 20 seconds.

136.565. Provision made for preventing operation of pneumatic brake-applying apparatus by double-heading cock—requirement. Where provision is made for preventing the operation of the pneumatic brake-applying apparatus of an automatic train stop or train control device when the double-heading cock is placed in double-heading position, the automatic train stop or train control device shall not be cut out before communication is closed between the engineman's automatic brake valve and the brake pipe, when operating double-heading cock toward double-heading position.

136.566. Locomotive of each train operating in train stop, train control or cab signal territory equipped. The locomotive from which brakes are controlled, of each train operating in automatic train stop, train control, or cab signal territory shall be equipped with apparatus responsive to the roadway equipment installed on all or any part of the route traversed, and such apparatus shall be in operative condition.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

136.567. Restrictions imposed when device fails, or cut-out enroute. Where an automatic train stop, train control, or cab signal device fails and/or is cut-out enroute, train may proceed at restricted speed or if an automatic block signal system is in operation according to signal indication but not to exceed medium speed, to the next available point of communication where report must be made to a designated officer. Where no automatic block signal system is in use train shall be permitted to proceed at restricted speed or where automatic block signal system is in operation according to signal indication but not to exceed medium speed to a point where absolute block can be established. Where an absolute block is established in advance of the train on which the device is inoperative train may proceed at not to exced 79 miles per hour.

136.568. Difference between speeds authorized by roadway signal and cab signal—action required. If for any reason a cab signal authorizes a speed different from that authorized by a roadway signal, when a train enters the block governed by such roadway signal, the lower speed shall not be exceeded.

Inspection and Tests—Roadway

136.576. Roadway element. Roadway elements, including those for test purposes, shall be gaged monthly for height and alinement, and shall be tested at least once every six months.

136.577. Test, acknowledgment and cut-in circuits. Test, acknowledgment and cut-in circuits shall be tested at least once every six months.

Inspection and Tests—Locomotive

136.586. Daily or after trip test. The automatic train stop, train control, or cab signal apparatus on each locomotive operating in equipped territory shall be inspected and tested either once every 24 hours or within 24 hours before departure upon each trip, except that such inspection and tests of the automatic train stop, train control or cab signal equipment on Diesel-electric and electric locomotives shall not be required provided that periodic tests be made on such locomotives each 6000 miles, or at intervals of not more than 2 months, whichever shall occur first.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carreir by order of the Commission shall constitute relief to the same extent from the requirements of this part.

136.587. Departure test. A test of the automatic train stop, train control, or cab signal apparatus on each locomotive, except locomotives and multiple-unit cars equipped with mechanical trip stop, shall be made over track elements or test circuits on departure of locomotive from its initial terminal and, if locomotive apparatus is cut-out between initial terminal and equipped territory, immediately prior to entering equipped territory, to determine if such apparatus is in service and is functioning properly. If such departure test is made by an employee other than engineman, the engineman shall be informed of the results of such test and a record kept thereof.

136.588. Periodic test. Except as provided in 136.586, periodic tests of the automatic train stop, train control or cab signal apparatus shall be made at least once every three months, and on multiple-unit cars as specified by the carrier, subject to approval by the Commission.

136.589. Relays. At least once every 4 years each relay shall be removed from service, subjected to thorough test, necessary repairs and adjustment made, and shall not be replaced in service unless its operating characteristics are in accordance with the limits within which such relay is designed to operate.

136.590. Pneumatic apparatus. Automatic train stop, train control, or cab signal pneumatic apparatus shall be inspected and cleaned at least once every six months.

SUBPART F—DRAGGING EQUIPMENT AND SLIDE DETECTORS AND OTHER SIMILAR PROTECTIVE DEVICES

136.601. Signals controlled by devices—location. Signals controlled by devices used to provide protection against unusual contingencies, such as landslides, dragging equipment, burned bridges or trestles and washouts shall be located so that stopping distance will be provided between the signal and the point where it is necessary to stop the train.

136.602. Operation in conjunction with automatic block signal system. Where these devices are in use in automatic block signal territory they shall be arranged to operate in conjunction with the automatic block signal system.

NOTE: Relief from the requirements of this section will be granted upon an adequate showing by an individual carrier. Relief heretofore granted to any carrier by order of the Commission shall constitute relief to the same extent from the requirements of this part.

Definitions

136.700. Definitions. For the purpose of these rules, standards, and instructions, the following definitions will apply:

136.701. Application, brake; full service. An application of the brakes resulting from a continuous or a split reduction in brake pipe pressure at a service rate until maximum brake cylinder pressure is developed. As applied to an automatic or electro-pneumatic brake with speed governor control, an application other than emergency which develops the maximum brake cylinder pressure, as determined by the design of the brake equipment for the speed at which the train is operating.

136.702. Arm, semaphore. The part of a semaphore signal displaying an aspect. It consists of a blade fastened to a spectacle.

136.703. Aspect. The appearance of a roadway signal conveying an indication as viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an observer in the cab.

136.704. Aspect, phantom signal. An aspect displayed by a light signal, different from the aspect intended, caused by light from an external source being reflected by the optical system of the signal.

136.705. Bar, locking. A bar in an interlocking machine to which the locking dogs are attached.

136.706. Bed, locking. That part of an interlocking machine that contains or holds the tappets, locking bars, cross-locking, dogs and other apparatus used to interlock the levers.

136.707. Blade, semaphore. The extended part of a semaphore arm which shows the position of the arm.

136.708. Block. A length of track of defined limits, the use of which by trains is governed by block signals, cab signals, or both.

136.709. Block, absolute. A block in which no train is permitted to enter while it is occupied by another train.

136.710. Block, latch. The lower extremity of a latch rod which engages with a square shoulder of the segment or quadrant to hold the lever in position.

136.711. Bond, rail joint. A metallic connection attached to adjoining rails to insure electrical conductivity.

136.712. Brake pipe. A pipe running from the engineman's brake valve through the train, used for the transmission of air under pressure to charge and actuate the automatic brake equipment and charge the reservoirs of the electro-pneumatic brake equipment on each vehicle of the train.

136.713. Bridge, movable. That section of a structure bridging a navigable waterway so designed that it may be displaced to permit passage of traffic on the waterway.

136.714. Cab. The compartment of a locomotive from which the propelling power and power brakes of the train are manually controlled.

136.715. Chain, safety. A chain provided for the purpose of preventing the receiver of a continuous inductive automatic train stop, train control or cab signal device from falling should it become detached from its normal support.

136.716. Changer, pole. A device by which the direction of current flow in an electrical circuit may be changed.

136.717. Characteristics, operating. As applied to electrical apparatus, the measure of the electrical values at which the apparatus operates. (Droy-away, pick-up, working value, etc.)

136.718. Chart, dog. A diagrammatic representation of the mechanical locking of an interlocking machine, used as a working plan in making up, assembling and fitting the locking.

136. 719. Circuit, acknowledgment. A circuit consisting of wire or other conducting material installed between the track rails at each signal in territory where an automatic train stop system or cab signal system of the continuous inductive type with 2-indication cab signals is in service, to enforce acknowledgment by the engineman at each signal displaying an aspect requiring a stop.

136.720. Circuit, common return. A term applied where one wire is used for the return of more than one electric circuit.

136.721. Circuit, control. An electrical circuit between a source of electric energy and a device which it operates.

136.722. Circuit, cut-in. A roadway circuit at the entrance to automatic train stop, train control or cab signal territory by means of which locomotive equipment of the continuous inductive type is actuated so as to be in operative condition.

136.723. Circuit, double wire; line. An electric circuit not employing a common return wire; a circuit formed by individual wires throughout.

136.724. Circuit, shunt fouling. The track circuit in the fouling section of a turnout, connected in multiple with the track circuit in the main track.

136.725. Circuit, switch shunting. A shunting circuit which is closed through contacts of a switch circuit controller.

136.726. Circuit, track. An electrical circuit of which the rails of the track form a part.

136.727. Circuit, track; coded. A track circuit in which the energy is varied or interrupted periodically.

136.728. Circuit, trap. A term applied to a circuit used where it is desirable to provide a track circuit but where it is impracticable to maintain a track circuit.

136.729. Cock, double-heading. A manually operated valve by means of which the control of brake operation is transferred to the leading locomotive.

136.730. Coil, receiver. Concentric layers of insulated wire wound around the core of a receiver of an automatic train stop, train control or cab signal device on a locomotive.

136.731. Controller, circuit. A device for opening and closing electric circuits.

136.732. Controller, circuit; switch. A device for opening and closing electric circuits, operated by a rod connected to a switch, derail or movable-point frog.

136.733. Current, foreign. A term applied to stray electric currents which may affect a signaling system, but which are not a part of the system.

136.734. Current of traffic. The movement of trains on a specified track in a designated direction.

136.735. Current, leakage. A stray electric current of relatively small value which flows through or across the surface of insulation when a voltage is impressed across the insulation.

136.736. Cut-section. A location other than a signal location where two adjoining track circuits end within a block.

136.737. Cut-section, relayed. A cut-section where the energy for one track circuit is supplied through front contacts or through front and polar contacts of the track relay for the adjoining track circuit.

136.738. Detector, point. A circuit controller which is part of the switch operating mechanism and operated by a rod connected to a switch, derail or movable-point frog to indicate that the point is within a specified distance of the stock rail.

136.739. Device, acknowledging. A manually operated electric switch or pneumatic valve by means of which, on a locomotive equipped with an automatic train stop or train control device, an automatic brake application can be forestalled, or by means of which, on a locomotive equipped with an automatic cab signal device, the sounding of the cab indicator can be silenced.

136.740. Device, reset. A device whereby the brakes may be released after an automatic train control brake application.

Definitions

136.700. Definitions. For the purpose of these rules, standards, and instructions, the following definitions will apply:

136.701. Application, brake; full service. An application of the brakes resulting from a continuous or a split reduction in brake pipe pressure at a service rate until maximum brake cylinder pressure is developed. As applied to an automatic or electro-pneumatic brake with speed governor control, an application other than emergency which develops the maximum brake cylinder pressure, as determined by the design of the brake equipment for the speed at which the train is operating.

136.702. Arm, semaphore. The part of a semaphore signal displaying an aspect. It consists of a blade fastened to a spectacle.

136.703. Aspect. The appearance of a roadway signal conveying an indication as viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an observer in the cab.

136.704. Aspect, phantom signal. An aspect displayed by a light signal, different from the aspect intended, caused by light from an external source being reflected by the optical system of the signal.

136.705. Bar, locking. A bar in an interlocking machine to which the locking dogs are attached.

136.706. Bed, locking. That part of an interlocking machine that contains or holds the tappets, locking bars, cross-locking, dogs and other apparatus used to interlock the levers.

136.707. Blade, semaphore. The extended part of a semaphore arm which shows the position of the arm.

136.708. Block. A length of track of defined limits, the use of which by trains is governed by block signals, cab signals, or both.

136.709. Block, absolute. A block in which no train is permitted to enter while it is occupied by another train.

136.710. Block, latch. The lower extremity of a latch rod which engages with a square shoulder of the segment or quadrant to hold the lever in position.

136.711. Bond, rail joint. A metallic connection attached to adjoining rails to insure electrical conductivity.

136.712. Brake pipe. A pipe running from the engineman's brake valve through the train, used for the transmission of air under pressure to charge and actuate the automatic brake equipment and charge the reservoirs of the electro-pneumatic brake equipment on each vehicle of the train.

136.713. Bridge, movable. That section of a structure bridging a navigable waterway so designed that it may be displaced to permit passage of traffic on the waterway.

136.714. Cab. The compartment of a locomotive from which the propelling power and power brakes of the train are manually controlled.

136.715. Chain, safety. A chain provided for the purpose of preventing the receiver of a continuous inductive automatic train stop, train control or cab signal device from falling should it become detached from its normal support.

136.716. Changer, pole. A device by which the direction of current flow in an electrical circuit may be changed.

136.717. Characteristics, operating. As applied to electrical apparatus, the measure of the electrical values at which the apparatus operates. (Droy-away, pick-up, working value, etc.)

136.718. Chart, dog. A diagrammatic representation of the mechanical locking of an interlocking machine, used as a working plan in making up, assembling and fitting the locking.

136. 719. Circuit, acknowledgment. A circuit consisting of wire or other conducting material installed between the track rails at each signal in territory where an automatic train stop system or cab signal system of the continuous inductive type with 2-indication cab signals is in service, to enforce acknowledgment by the engineman at each signal displaying an aspect requiring a stop.

136.720. Circuit, common return. A term applied where one wire is used for the return of more than one electric circuit.

136.721. Circuit, control. An electrical circuit between a source of electric energy and a device which it operates.

136.722. Circuit, cut-in. A roadway circuit at the entrance to automatic train stop, train control or cab signal territory by means of which locomotive equipment of the continuous inductive type is actuated so as to be in operative condition.

136.723. Circuit, double wire; line. An electric circuit not employing a common return wire; a circuit formed by individual wires throughout.

136.724. Circuit, shunt fouling. The track circuit in the fouling section of a turnout, connected in multiple with the track circuit in the main track.

136.725. Circuit, switch shunting. A shunting circuit which is closed through contacts of a switch circuit controller.

136.726. Circuit, track. An electrical circuit of which the rails of the track form a part.

136.727. Circuit, track; coded. A track circuit in which the energy is varied or interrupted periodically.

136.728. Circuit, trap. A term applied to a circuit used where it is desirable to provide a track circuit but where it is impracticable to maintain a track circuit.

136.729. Cock, double-heading. A manually operated valve by means of which the control of brake operation is transferred to the leading locomotive.

136.730. Coil, receiver. Concentric layers of insulated wire wound around the core of a receiver of an automatic train stop, train control or cab signal device on a locomotive.

136.731. Controller, circuit. A device for opening and closing electric circuits.

136.732. Controller, circuit; switch. A device for opening and closing electric circuits, operated by a rod connected to a switch, derail or movable-point frog.

136.733. Current, foreign. A term applied to stray electric currents which may affect a signaling system, but which are not a part of the system.

136.734. Current of traffic. The movement of trains on a specified track in a designated direction.

136.735. Current, leakage. A stray electric current of relatively small value which flows through or across the surface of insulation when a voltage is impressed across the insulation.

136.736. Cut-section. A location other than a signal location where two adjoining track circuits end within a block.

136.737. Cut-section, relayed. A cut-section where the energy for one track circuit is supplied through front contacts or through front and polar contacts of the track relay for the adjoining track circuit.

136.738. Detector, point. A circuit controller which is part of the switch operating mechanism and operated by a rod connected to a switch, derail or movable-point frog to indicate that the point is within a specified distance of the stock rail.

136.739. Device, acknowledging. A manually operated electric switch or pneumatic valve by means of which, on a locomotive equipped with an automatic train stop or train control device, an automatic brake application can be forestalled, or by means of which, on a locomotive equipped with an automatic cab signal device, the sounding of the cab indicator can be silenced.

136.740. Device, reset. A device whereby the brakes may be released after an automatic train control brake application.

136.741. Distance, stopping. The maximum distance on any portion of any railroad which any train operating on such portion of railroad at its maximum authorized speed, will travel during a full service application of the brakes, between the point where such application is initiated and the point where the train comes to a stop.

136.742. Dog, locking. A steel block attached to a locking bar or tappet of an interlocking machine, by means of which locking between levers is accomplished.

136.743. Dog, swing. A locking dog mounted in such a manner that it is free to rotate on a trunnion which is riveted to a locking bar.

CROSS REFERENCE: Element, contact see receiver.

136.744. Element, roadway. That portion of the roadway apparatus of automatic train stop, train control or cab signal system, such as electric circuit, inductor, magnet, ramp or trip arm to which the locomotive apparatus of such system is directly responsive.

136.745. Face, locking. The locking surface of a locking dog, tappet or cross locking of an interlocking machine.

136.746. Feature, restoring. An arrangement on a power operated switch movement by means of which power is applied to restore the switch movement to full normal or to full reverse position, before the driving bar creeps sufficiently to unlock the switch, with control lever in normal or reverse position.

136.747. Forestall. As applied to an automatic train stop or train control device, to prevent an automatic brake application by operation of an acknowledging device or by manual control of the speed of the train.

136.748. Hanger, safety. A rigid member provided for the purpose of preventing the receiver of a continuous inductive automatic train stop, train control or cab signal device from falling should it become detached from its normal support.

136.749. Indication. The information conveyed by the aspect of a signal.

CROSS REFERENCE: Inductor See Element, Roadway.

136.750. Interlocking automatic. An arrangement of signals, with or without other signal appliances, which function through the exercise of inherent powers as distinguished from those whose functions are controlled manually, and which are so interconnected by means of electric circuits that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indication.

136.751. Interlocking, manual. An arrangement of signals and signal appliances operated from an interlocking machine and so interconnected by means of mechanical and/or electric locking that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indication.

136.752. Joint Rail, insulated. A joint in which electrical insulation is provided between adjoining rails.

136.753. Limits, interlocking. The tracks between the opposing home signals of an interlocking.

136.754. Line, open wire. An overhead wire line consisting of single conductors as opposed to multiple-conductor cables.

136.755. Link, rocker. That portion of an interlocking machine which transmits motion between the latch and the universal link.

136.756. Lock, bolt. A mechanical lock so arranged that if a switch, derail or movable point frog is not in the proper position for a train movement, the signal governing that movement cannot display an aspect to proceed; and that will prevent a movement of the switch, derail or movable-point frog unless the signal displays its most restrictive aspect.

136.757. Lock, electric. A device to prevent or restrict the movement of a lever, a switch or a movable bridge, unless the locking member is withdrawn by an electrical device, such as an electromagnet, solenoid or motor.

136.758. Lock, electric, forced drop. An electric lock in which the locking member is mechanically forced down to the locked position.

136.759. Lock, facing point. A mechanical lock for a switch derail or movable-point frog, comprising a plunger stand and a plunger which engages a lock rod attached to the switch point to lock the operated unit.

136.760. Locking, approach. Electric locking effective while a train is approaching, within a specified distance, a signal displaying an aspect to proceed, and which prevents, until after the expiration of a predetermined time interval after such signal has been caused to display its most restrictive aspect, the movement of any interlocked or electrically locked switch, movable-point frog, or derail in the route governed by the signal, and which prevents an aspect to proceed from being displayed for any conflicting route.

136.761. Locking, electric. The combination of one or more electric locks and controlling circuits by means of which levers of an interlocking machine, or switches or other units operated in connection with signaling and interlocking, are secured against operation under certain conditions.

136.762. Locking, indication. Electric locking which prevents manipulation of levers that would result in an unsafe condition for a train movement if a signal, switch, or other operative unit fails to make a movement corresponding to that of its controlling lever, or which directly prevents the operation of a signal, switch, or other operative unit, in case another unit which should operate first fails to make the required movement.

136.763. Locking, latch operated. The mechanical locking of an interlocking machine which is actuated by means of the lever latch.

136.764. Locking, lever operated. The mechanical locking of an interlocking machine which is actuated by means of the lever.

136.765. Locking, mechanical. An arrangement of locking bars, dogs, tappets, cross locking and other apparatus by means of which interlocking is effected between the levers of an interlocking machine and so interconnected that their movements must succeed each other in a predetermined order.

136.766. Locking, movable bridge. The rail locks, bridge locks, bolt locks, circuit controllers, and electric locks used in providing interlocking protection at a movable bridge.

136.767. Locking, route. Electric locking, effective when a train passes a signal displaying an aspect for it to proceed, which prevents the movement of any switch, movable-point frog, or derail in advance of the train within the route entered. It may be so arranged that as a train clears a track section of the route, the locking affecting that section is released.

136.768. Locking, time. A method of locking, either mechanical or electrical, which, after a signal has been caused to display an aspect to proceed, prevents, until after the expiration of a predetermined time interval after such signal has been caused to display its most restrictive aspect, the operation of any interlocked or electrically locked switch, movable-point frog, or derail in the route governed by that signal, and which prevents an aspect to proceed from being displayed for any conflicting route.

136.769. Locking, traffic. Electric locking which prevents the manipulation of levers or other devices for changing the direction of traffic on a section of track while that section is occupied or while a signal displays an aspect for a movement to proceed into that section.

136.770. Locomotive. A self-propelled unit of equipment which can be used in train service.

136.771. Machine, control. An assemblage of manually operated devices for controlling the functions of a traffic control system; it may include a track diagram with indication lights.

136.772. Machine, interlocking. An assemblage of manually operated levers or other devices for the control of signals, switches or other units.

CROSS REFERENCE: See Magnet, track—See Element, roadway.

136.773. Movements, conflicting. Movements over conflicting routes.

136.774. Movement, facing. The movement of a train over the points of a switch which face in a direction opposite to that in which the train is moving.

136.775. Movement, switch-and-lock. A device, the complete operation of which performs the three functions of unlocking, operating and locking a switch, movable-point frog or derail.

136.776. Movement, trailing. The movement of a train over the points of a switch which face in the direction in which the train is moving.

136.777. Operator, control. An employee assigned to operate the control machine of a traffic control system.

136.778. Piece, driving. A crank secured to a locking shaft by means of which horizontal movement is imparted to a longitudinal locking bar.

136.779. Plate, top. A metal plate secured to a locking bracket to prevent the cross locking from being forced out of the bracket.

136.780. Plunger, facing point lock. That part of a facing point lock which secures the lock rod to the plunger stand when the switch is locked.

136.781. Point, clearance. The location on a turnout at which the carrier's specified clearance is provided between tracks.

136.782. Point, controlled. A location where signals and/or other functions of a traffic control system are controlled from the control machine.

136.783. Point, stop-indication. As applied to an automatic train stop or train control system without the use of roadway signals, a point where a signal displaying an aspect requiring a stop would be located.

136.784. Position, deenergized. The position assumed by the moving member of an electromagnetic device when the device is deprived of its operating current.

136.785. Position, false restrictive. A position of a semaphore arm that is more restrictive than it should be.

136.786. Principle, closed circuit. The principle of circuit design where a normally energized electric circuit which, on being interrupted or deenergized, will cause the controlled function to assume its most restrictive condition.

136.787. Protection, cross. An arrangement to prevent the improper operation of a signal, switch, movable-point frog, or derail as the result of a cross in electrical circuits.

CROSS REFERENCE: Ramp, See element, roadway.

136.788. Receiver. A device on a locomotive, so placed that it is in position to be influenced inductively or actuated by an automatic train stop, train control or cab signal roadway element.

136.789. Relay, timing. A relay which will not close its front contacts or open its back contacts, or both, until the expiration of a definite time interval after the relay has been energized.

136.790. Release, time. A device used to prevent the operation of an operative unit until after the expiration of a predetermined time interval after the device has been actuated.

136.791. Release value. The electrical value at which the movable member of an electromagnetic device will move to its deenergized position.

136.792. Reservoir, equalizing. An air reservoir connected with and adding volume to the top portion of the equalizing piston chamber of the automatic brake valve, to provide uniform service reductions in brake pipe pressure regardless of the length of the train.

CROSS REFERENCE: Rod, lock—See link, rocker.

136.793. Rod, lock. A rod, attached to the front rod or lug of a switch, movable-point frog or derail, through which a locking plunger may extend when the switch points or derail are in the normal or reverse position.

136.794. Rod, up-and-down. A rod used for connecting the semaphore arm to the operating mechanism of a signal.

136.795. Route. The course or way which is, or is to be, traveled.

136.796. Routes, conflicting. Two or more routes, opposing, converging or intersecting, over which movements cannot be made simultaneously without possibility of collision.

136.797. Route, interlocked. A route within interlocking limits.

136.798. Section, dead. A section of track, either within a track circuit or between two track circuits, the rails of which are not part of a track circuit.

136.799. Section, fouling. The section of track between the switch points and the clearance point in a turnout.

136.800. Sheet, locking. A description in tabular form of the locking operations in an interlocking machine.

CROSS REFERENCE: Shoe—See receiver.

136.801. Shoe, latch. The casting by means of which the latch rod and the latch block are held to a lever of a mechanical interlocking machine.

136.802. Shunt. A by-path in an electrical circuit.

136.803. Signal, approach. A roadway signal used to govern the approach to another signal and if operative so controlled that its indication furnishes advance information of the indication of the next signal.

136.804. Signal, block. A roadway signal operated either automatically or manually at the entrance to a block.

136.805. Signal, cab. A signal located in engineman's compartment or cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals.

136.806. Signal, home. A roadway signal at the entrance to a route or block to govern trains in entering and using that route or block.

136.807. Signal, interlocking. A roadway signal which governs movements into or within interlocking limits.

136.808. Signals, opposing. Roadway signals which govern movements in opposite directions on the same track.

136.809. Signal, slotted mechanical. A mechanically operated signal with an electromagnetic device inserted in its operating connection to provide a means of controlling the signal electrically, as well as mechanically.

136.810. Spectacle, semaphore arm. That part of a semaphore arm which holds the roundels and to which the blade is fastened.

136.811. Speed, medium. A speed not exceeding 40 miles per hour.

136.812. Speed, restricted. A speed that will permit stopping short of another train or obstruction, but not exceeding 20 miles per hour.

136.813. Speed, slow. A speed not exceeding 20 miles per hour.

136.814. Station, control. The place where the control machine of a traffic control system is located.

136.815. Stop. As applied to mechanical locking, a device secured to a locking bar to limit its movement.

136.816. Superiority of trains. The precedence conferred upon one train over other trains by train order or by reason of its class or the direction of its movement.

136.817. Switch, electro-pneumatic. A switch operated by an electro-pneumatic switch-and-lock movement.

136.818. **Switch, facing point.** A switch, the points of which face traffic approaching in the direction for which the track is signaled.

136.819. **Switch, hand operated.** A non-interlocked switch which can only be operated manually.

136.820. **Switch, interlocked.** A switch within the interlocking limits, the control of which is interlocked with other functions of the interlocking.

136.821. **Switch, sectionalizing.** A switch for disconnecting a section of a power line from the source of energy.

136.822. **Switch, spring.** A switch equipped with a spring device which forces the points to their original position after being trailed through and holds them under spring compression.

136.823. **Switch, trailing point.** A switch, the points of which face away from traffic approaching in the direction for which the track is signaled.

136.824. **System, automatic block signal.** A block signal system wherein the use of each block is governed by an automatic block signal, cab signal, or both.

136.825. **System, automatic train control.** A system so arranged that its operation will automatically result in the following:

> A full service application of the brakes which will continue either until the train is brought to a stop, or, under control of the engineman, its speed is reduced to a predetermined rate.
>
> When operating under a speed restriction, an application of the brakes when the speed of the train exceeds the predetermined rate and which will continue until the speed is reduced to that rate.

136.826. **System, automatic train stop.** A system so arranged that its operation will automatically result in the application of the brakes until the train has been brought to a stop.

136.827. **System, block signal.** A method of governing the movement of trains into or within one or more blocks by block signals or cab signals.

136.828. **System, traffic control.** A block signal system under which train movements are authorized by block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

136.829. **Terminal, initial.** The starting point of a locomotive for a trip.

136.830. **Time, acknowledging.** As applied to an intermittent automatic train stop system, a predetermined time within which an automatic brake application may be forestalled by means of the acknowledging device.

136.831. **Time, delay.** As applied to an automatic train stop or train control system the time which elapses after an automatic brake application is initiated until the brakes start to apply.

136.832. **Train.** A locomotive or more than one locomotive coupled, with or without cars.

136.833. **Train, opposing.** A train, the movement of which is in a direction opposite to and toward another train on the same track.

136.834. **Trip.** A movement of a locomotive over all or any portion of automatic train stop, train control or cab signal territory between the terminals for that locomotive; a movement in one direction.

CROSS REFERENCE: Trip-arm—See Element, roadway.

136.835. **Trunking.** A casing used to protect electrical conductors.

136.836. **Trunnion.** A cylindrical projection supporting a revolving part.

136.837. **Valve, electro-pneumatic.** A valve electrically operated which, when operated, will permit or prevent passage of air.

136.838. **Wire, shunt.** A wire forming part of a shunt circuit.

137.1 - VOLTMETER TEST FOR GROUNDS - The purpose of this test is to detect any ground which might cause subsequent signal failures.

This test will be performed at intervals prescribed by current Instructions I-120, or when apparatus has been damaged by lightning; voltmeter readings will be taken on all associated wire and apparatus to determine if grounds exist.

Using suitable voltmeter, connect positive lead from meter to positive side of battery and negative meter lead to ground; if meter shows any deflection of pointer it denotes a negative ground. Next connect positive meter lead to ground and negative meter lead to negative side of battery; if meter shows any deflection of pointer it denotes a positive ground. If reading is observed on voltmeter, use ammeter to determine current. When using ammeter care should be taken to prevent instrument from being damaged.

Grounded battery reading in excess of .002 ampere should be cleared.

137.2 - TRACK CIRCUIT SHUNTING SENSITIVITY - The purpose of this test is to determine the maximum shunt resistance that will cause track relay to release.

Test should be made during very dry weather or during the winter when earth is frozen. The most adverse shunting condition occurs when ballast resistance is at its maximum. At this time maximum current flows through relay coils. See current Instructions I-101.

137.3 - TRACK CIRCUITS - See Definition 136.726 - The purpose of this test is to insure that all bonding, rail connectors, fouling circuits, shunt connections, and insulated joints are properly installed and in good condition.

Visual inspection will be made of each item and any defects promptly repaired. See current Instructions I-101.

137.3a - TRACK CIRCUITS - FOREIGN CURRENT - The purpose of this test is to determine the presence of foreign current and insure proper corrective action, to prevent interference with track circuits.

Where track circuits are subject to direct current exposure, test should be made and readings taken during periods in which the outside current is at or near maximum value, which occurs during damp or wet weather. This test should be made by placing a voltmeter of 1.5 volt scale across the relay, then disconnecting the wires from the battery and observing whether the voltage is sufficient to pick up the relay. If the relay picks up, the circuit should be reported at once by wire. If the relay does not pick up a second test should be made in the same manner as the first, except place a connection around first one and then the other of the insulated joints at the battery end of the circuit. One of the rails of the circuit being tested will be connected to one side of the relay. The other rail in the circuit, plus one of the rails in the next circuit, will be connected to the other side of the relay, thus unbalancing the circuit and making a severe test. If the relay picks up the circuit should be reported by wire. If any appreciable readings are obtained in either test the following precautions shall be constantly observed:

Trolley and power companies requested annually to see that their bonding is as good as practicable.

Ballast kept clear from the rails.

Rail joints kept tight and insulated joints maintained in good condition.

Rail bonding carefully maintained.

Foreign current tests need not be made where foreign current protection is provided; where coded current is used for wayside signal control; where there is no apparent source of foreign current such as trolley lines, etc., or where tests for a 3 year period indicate no evidence of foreign current.

NOTE: Under certain conditions there is a storage battery effect between rails and ballast that may have a current value sufficient to hold the relay closed several minutes after the battery feed wires have been opened.

BALTIMORE & OHIO RAILROAD
B.&O. RULES, STANDARDS
& INSTRUCTIONS
Office of Signal Engineer
Baltimore, Md.
June 25, 1957

If such condition is observed, short circuit the rails temporarily before deciding that foreign current exists.

Cathodic rectifiers used by telephone companies and others to reduce electrolysis on their cables or pipe lines can cause serious foreign current on track circuits. Employees should report known installations of cathodic rectifiers and before these are placed in service, tests should be made as herein provided when cathodic rectifier is turned on and off. Reports of these tests are to be made to Division Engineer and copy to Signal Engineer. Owner of cathodic rectifier should be requested to disconnect same where track circuits are adversely affected.

137.3b - TRACK CIRCUITS - The purpose of this test is to determine why track circuit will not function in accordance with current Instructions I-101. See Form 921-G-Spl. for instructions.

When making Test No. 2 Form 921-G-Spl. must be furnished for any track circuit not meeting requirements. Care should be used in taking and recording "Test Data" or it is impossible to calculate "Computed Data". For example, "E2" must always be larger than "E5" account calculating ammeter resistance, for same reason "E4" must be larger than "E6".

137.4 - STORAGE BATTERIES - Visual inspection and voltage test. See current Instructions I-111 and I-112.

137.4a - BATTERIES - CAPACITY TEST - The purpose of this test is to insure that lead acid battery is in condition to deliver the rated capacity. Test to be made on all lead plate battery with "Exide Minute Man" in accordance with current Instructions I-140.

137.4b - PRIMARY BATTERIES - Visual inspection and voltage test. See current Instructions I-113 and I-139.

137.5 - ARRESTER GROUNDS - The purpose of this test is to insure that grounds are permanently connected to earth through a ground connection of sufficiently low impedence and having sufficient current carrying capacity to prevent the building up of voltages which may result in undue hazard to connected apparatus or persons.

A direct reading "Meg" ground tester having a self-contained source of energy with range from zero to 300 ohms shall be used for testing grounds.

Each lead shall consist of 50 feet of single conductor No. 14 A.W.G. (19 strand) soft drawn copper wire, 5/64 inch insulation.

In damp or foggy weather care should be taken to avoid leakage between the binding posts on the instrument.

Reference ground rods shall consist of a copper or bronze rod not less than one-fourth inch in diameter and 3 or 4 feet long pointed on one end.

When testing grounds connected to high or intermediate voltage arresters, rubber gloves shall be worn by persons making connections and operating ground tester.

Do not test grounds while there is a thunder storm in the vicinity.

Test may be performed by either of the following methods:

(a) Set one reference ground at right angle to track, approximately 50 feet from ground under test. Connect ground megger as follows: Terminal "P" to track side of relay coil or track side of battery wire. Terminal "C" to reference ground. Terminal "G" to ground under test.

(b) Set two reference grounds parallel to track, each reference ground to be located approximately 50 feet from ground under test. Connect ground megger as follows: Terminal "P" to what appears to be best reference ground. Terminal "C" to the other reference ground. Terminal "G" to ground under test. Ground resistance shall be measured at the time of installation and every two years thereafter, preferably during the months of April and May. Ground post of ground megger shall be connected to the ground post of the lightning arrester at the distant end of ground lead so as to insure the continuity of the ground circuit. See current Instructions I-117.

137.6 - GENERAL INSPECTION - The purpose of this inspection is to insure apparatus is serviceable and in good physical condition.

Inspect physical condition of track, switches, signals, signal bridges, foundations, pipe lines, machine, tower, and other buildings involved. Check tower and other buildings for fire hazard. Perform tests 1, 8, 8b, 9, 10, 16, 17, 18, 19, 20, 20a, 21, 22, 25, 26, and 27.

General inspection of apparatus outside interlocking limits will be made in conjunction with other tests.

137.6a - GENERAL INSPECTION OF PLANTS MAINTAINED BY FOREIGN ROADS - The purpose of this inspection is to insure apparatus is serviceable and in good physical condition.

Inspect physical condition of track, switches, signals, signal bridges, foundations, pipe lines, and machine. If possible to arrange, make this inspection jointly with supervisory officer of maintaining road.

137.7 - SIGNAL MECHANISMS - The purpose of this test is to insure that power operated semaphore signals are free from friction or other interference which might prevent return to most restrictive aspect.

Test procedure in accordance with A.A.R. Signal Section Manual Part 54 and Manufacturer's Instructions.

See I.C.C. Rules 136.22, 136.26, 136.27, and 136.76.

137.7a - SIGNAL MECHANISMS - The purpose of this inspection is to insure that signal mechanism is maintained in safe and suitable condition for service.

Semaphore signals shall not be placed in service until bearings have been cleaned, and oil, dirt, and grease removed from the armature, gears, and poles of slot magnets, all parts lubricated, and preferably after electrical torque tests have been made.

Lamp brackets shall be securely fastened and all parts of lamp shall clear spectacle not less than one-half inch.

Bearings shall be lubricated and kept free from grit and dirt.

Mechanism shall be kept in proper adjustment.

Electrical contacts shall be kept clean and in proper adjustment.

See I.C.C. Rules 136.22, 136.26, 136.27, and 136.76.

137.8 - SWITCH CIRCUIT CONTROLLERS - See Definition 136.732 - The purpose of this test is to insure that switch circuit controllers are in good condition and in proper adjustment.

Switch circuit controller shall be so adjusted that when point is open one-fourth inch or more, track or control circuits will be shunted or opened or both.

Switch circuit controller, rod, or point lug with excessive lost motion must be replaced. Contacts must be kept clean.

Bolts, nuts, pins, and cotters of proper size and type must be kept in place, nuts kept tight, and cotters properly spread.

Covers and fastenings must be kept in good condition with suitable gaskets in place, so as to keep out moisture and dirt.

Ventilators must be kept free from obstruction.

Wire entrances must be kept sealed.

See I.C.C. Rules 136.6, 136.7, and 136.57.

137.8a - POINT DETECTOR - See Definition 136.738 - The purpose of this test is to insure that point detector is in good condition and properly adjusted.

Point detector shall be checked when adjustments are made on switch points or lock rod.

Point detector circuit controller shall not indicate switch point closure if the switch point is prevented from closing to within one-fourth inch where latch-out device is not used, and to within three-eighths inch where latch-out device is used.

Point detector adjustments shall be made in accordance with Manufacturer's Instructions.

137.9 - FOULING CIRCUITS - See Definition 136.724 - The purpose of this test is to insure that fouling wires provide good electrical connection between main rails of a track circuit and sections of rail blocked off by insulated joints in turnouts, crossovers, etc.

Make thorough visual inspection of all parts of fouling wires on interlocked and hand-operated turnouts and crossovers which are open to such inspection. Connect voltmeter across main track rails and apply shunt to turnout or crossover rails, observing the track relay releases or that voltage reading on voltmeter is less than release value of relay.

See I.C.C. Rules 136.57 and 136.58.

137.10 - INSULATED JOINTS - See Definition 136.752 - The purpose of this inspection is to insure that insulated rail joints are maintained in good condition, drainage provided, insulation in place, track circuit connectors tight, and ties properly spaced and tamped.

See current Instructions I-101 and I.C.C. Rule 136.59.

137.11 - RELAYS D.C. - The purpose of this test is to insure that relays and electromagnetic devices are in proper condition and function as intended.

See current Instructions I-105, I-106, and Manufacturer's Instructions.

137.11a - ELECTRIC LOCKS - See Definition 136.757, 136.758 - The purpose of this test is to insure that electric locks are in proper condition and function as intended.

See current Instructions I-109 and Manufacturer's Instructions.

137.11b - D.C. APPARATUS, REPLACEMENT - Tests shall be made immediately when repair, adjustment, change or replacement is made in any part of the system to determine that proper operation is assured.

137.12 - RELAYS A.C. - The purpose of this test is to insure that relays and electromagnetic devices are in proper condition and function as intended.

See Manufacturer's Instructions.

137.12a - A.C. APPARATUS, REPLACEMENT - See Rule 137.11b.

137.13 - ARRESTERS (GAS TYPE) - The purpose of this test is to determine that arresters are in condition to provide the desired protection.

Tests shall be conducted on all arresters of this type in accordance with instructions furnished with the test set for this purpose.

137.13a - ARRESTERS (OTHER TYPES) - A 500 volt megger insulation tester shall be used for this purpose.

To test low voltage arresters disconnect ground wire from arresters to be tested. Connect one megger lead to ground side of arresters, the other megger lead to line side of arrester. Reading obtained should be one megohm or more.

To test intermediate or high voltage arresters (intermediate 175 to 600 volts - high voltage 600 volts and up) open switch or switches de-energizing the line. Megger entire line; if line meggers one megohm or more it can be assumed that arresters are O.K. and only a visual inspection of arrester will be necessary. If reading is less than one megohm test as follows:

Ground the line circuit. Open arrester ground wire between arrester and ground. Connect one megger lead to ground wire, the other megger lead to ground side of arrester under test. Arresters shall test 3 megohms or more. If arrester tests less than 3 megohms disconnect ground from transformer case and retest. Electrical protection gloves shall be worn when testing arresters on intermediate or high voltage circuits.

Do not test arresters while there is a thunder storm in vicinity.

This instruction shall not be construed as a modification of Joint Circular entitled "Instructions for Employees Engaged in the Maintenance, Construction or Renewal of Electrical Transmission, Distribution or Control Wires or Cables", dated January 1, 1958.

137.13b - ARRESTERS - In case of severe storm, inspection shall be made as soon as practicable thereafter, examining lightning arresters, fuses, relays and rectifiers.

137.14 - INSULATION TEST - See current Instructions I-127 and I.C.C. Rule 136.108.

137.15 - POLE LINE - The purpose of this inspection is to insure that pole line is in good physical condition.

Visual inspection will include condition of poles, crossarms, insulators, wire sag and other associated apparatus, also whether sufficient clearance exists between wires and track, trees, brush or other obstructions.

137.16 - MECHANICAL LOCKING - See Definition 136.765 - The purpose of this test is to determine that mechanical locking is in accordance with plans and specifications and in such condition as to insure proper functioning.

See current Instructions I-110, and I.C.C. Rules 136.335 to 136.341 inclusive.

137.17 - APPROACH LOCKING - See Definition 136.760 - Determine that the approach relay is de-energized when each track circuit in the approach circuit is shunted separately.

Determine that after a signal has been cleared and with the approach circuit opened and the signal restored to display the stop indication, the route governed by that signal cannot be changed until after a predetermined time interval has elapsed.

137.18 - TIME LOCKING - See Definition 136.768 - Determine that after a signal has been cleared the route governed by that signal cannot be changed until after the signal has been restored to display the stop indication and a predetermined time interval has elapsed.

When approach locking is used open approach circuit before starting test.

137.19 - ROUTE LOCKING - See Definition 136.767 - The purpose of this test is to insure that route cannot be changed after acceptance by a train.

Line up route to be tested and cause signal to display proceed indication, then place signal lever normal after first track circuit in route is shunted.

When approach locking is used open approach circuit before starting test. Commence at entering end of route and shunt each track circuit as follows:

Track circuit in advance must be shunted before shunt is removed from last track circuit shunted. At time shunts are being applied attempt will be made at control point to move facing point lock, switches, derails, and movable point frogs located in track circuit that is shunted and each advance track circuit in the route.

This test can be made by observing that locking relay is de-energized for each facing point lock, switch, derail or movable point frog while train is passing over route.

137.20 - INDICATION LOCKING SIGNALS - See Definition 136.762 - The purpose of this test is to insure that levers of power and electro-mechanical machines and latches of mechanical levers cannot be placed in full normal position until the respective control relays for light signals are de-energized and the respective arms of semaphore signals are within 5 degrees of their normal position.

When making this test hold signal lever against indication lock, then check all levers controlling functions in the route including opposing signals. Mechanical locking must prevent any change in route.

WHERE LOCK IS ON SIGNAL LEVER CONTROLLING LIGHT SIGNALS. Disconnect lock circuit wire or signal repeater circuit at each relay contact in the circuit on the side of the contact from which battery is feeding, attempt to place signal lever in full normal position while each contact is open.

WHERE LOCK IS ON LEVER CONTROLLING SEMAPHORE SIGNALS. Move each signal arm in the circuit approximately 15 degrees from its normal position and slowly return it to within approximately 5 degrees of normal position. Signal lever should not indicate normal until signal arm is within 5 degrees of normal position. On signal mechanism equipped with zero position lock apply power or turn motor armature by hand to move signal arm 15 degrees from zero.

WHERE LOCKING IS ACCOMPLISHED WITHOUT LOCK ON SIGNAL LEVER. Perform applicable test as described in preceding paragraph except leave signal lever normal. Attempt to move facing point locks, switches, derails and movable point frogs while each signal repeater contact is open or signal arm is not within 5 degrees of normal.

At some locations it may be necessary to release approach relay when making this test.

137.20a - INDICATION LOCKING POWER-OPERATED SWITCHES - When operated, locked and indicated by the same lever. The purpose of this test is to insure that controlling lever cannot be latched in either full normal or full reverse position unless switch or switches operated by the lever have properly operated to the corresponding positions.

Test each switch lever for each switch involved for both normal and reverse indication - first - with one inch obstruction to allow switch movement to operate but not to lock the switch, and - second - with valve stem removed from lock magnet of E.P. switches or with fuse removed from electric switches to prevent any operation of the switch movement. Under these conditions it must be impossible to complete the movement of switch levers.

137.21 - TRAFFIC LOCKING - See Definition 136.769 - The purpose of this test is to insure that the lock or circuiting will prevent a change in the direction of traffic on a section of track while occupied or while a signal displays an aspect for a movement to proceed into that section.

First - observe that when traffic control relay is de-energized traffic cannot be changed, then place voltmeter across coils of traffic control relay while train is entering and within the block. Observe that voltmeter reads zero during entire time.

137.22 - SWITCH OBSTRUCTION TEST - The purpose of this test is to insure that switch is in proper adjustment.

Insert one-fourth inch obstruction between switch point and stock rail, six inches from switch point of each mechanical and power switch and attempt to lock switch. Test each machine in both normal and reverse position.

Make this test with hand crank on electric operated switches, and from machine on mechanical and electro-pneumatic switches.

Air pressure must be reduced when making obstruction tests on electro-pneumatic switch machines. Edges of lock rod and plunger or dog on facing point lock or switch and lock movement shall be kept square and notch in lock rod shall not be more than three-eighths inch larger than plunger or dog.

137.23 - E.P. VALVE TEST - The purpose of these tests are to detect leakage in E.P. switch valves and cylinders.

Test each set of valves with switches in both normal and reverse positions by holding in lock and reverse armatures for approximately one minute while normal magnet is energized, and lock and normal armatures while reverse magnet is energized. If switch changes position valves are defective and should be replaced.

Cylinders shall be inspected and tested in service by application of air pressure with apparatus at rest. This shall be done at least once every three months to insure that parts are clean, packing tight, air supply unrestricted, and apparatus functioning efficiently.

137.24 - CROSS PROTECTION - See Definition 136.787 - The purpose of this test is to insure that protective devices operate properly to prevent movement of switches when current is improperly applied to the circuit.

Test should be made when plant battery voltage is at its maximum.

Operate switch to charge polar relay. Adjust rheometer to highest resistance and make temporary connection to normal and reverse operating wires at the pole changer of switch under test. Adjust rheometer until polar relay opens. Polar relay opening shall remove energy from switch.

The polar relay shall release on one-half the current required to operate the switch.

See G.R.S. pamphlet No. 533.

137.25 - TIME DEVICES - See Definition 136.789 - The purpose of this test is to insure that all clockwork, motor, and thermal timing devices operate as intended and are adjusted to not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release or relay.

See I.C.C. Rule 136.385.

137.26 - POWER SWITCH RESTORING FEATURE - See Definition 136.746 - The purpose of this test is to insure that switch movement will apply power and restore to full normal and reverse position before locking bar moves sufficiently to unlock switch.

ELECTRIC SWITCHES - Open power circuit and crank movement until "WP" circuit opens. (Switch must not be mechanically unlocked at this point.) Close power circuit and movement should return to position from which last operated.

E.P. SWITCHES - Use bar to move slide bar toward the opposite position and note that air comes on and restores slide bar before "WP" contacts have opened. Operation of contacts may be checked by visual observation, voltmeter, or observance of "WP" relay.

137.27 - BRIDGE LOCKING - See Definition 136.766 - This inspection and test has two purposes: First - Inspect to determine that bridge devices are functioning in a proper manner and sequence. This inspection should be performed jointly by Bridge and Signal Maintenance employees. Second - Test Signal Department devices used for checking bridge including circuit controllers, switch machines, electric locks, and circuits.

Tests and inspections of apparatus maintained by Signal Department to be made quarterly.

Compliance with I.C.C. Rule 136.312 at interlocked drawbridges requires close cooperation between Bridge and Signal employees, the chief burden being on the former.

Bridge equipment is used to operate the movable span and lock it into the fixed structure. The rule requires that this equipment be maintained so that the members on the movable span when locked are within one inch of surface and alignment with respect to the fixed structure.

Limit switches or other bridge devices are necessary to insure that the bridge is securely locked as above provided before power can be applied to the bridge equipment which locks the rails. The rule requires that these rail locks when used be maintained so that the rails on the movable span are within three-eighths inch of surface and alignment with respect to the rails on the fixed structure.

Signal devices are designed to check that this last sequence of bridge operation and locking of bridge devices has been performed. This checking is accomplished by a signal circuit controller actuated directly by the rail locking tongues or by a plunger driven through holes in the tongues and running rails. This initial operation of signal checking devices must remove power from the bridge operating and locking devices.

It is necessary to couple signal circuits or pipe lines or both from the movable to fixed structures. This operation is powered either from the bridge system used to lock the rail ends, from the signal device which checks that the rail locks have been applied or by a separate signal power or mechanical device.

BALTIMORE & OHIO RAILROAD

B.&O. RULES, STANDARDS & INSTRUCTIONS

Office of Signal Engineer
Baltimore, Md.
June 25, 1957

137.28 - A.T.S. INDUCTOR - See Definition 136.744 - See current Instructions I-138.

137.29 - HIGHWAY CROSSING SIGNALS AND GATES - The purpose of this test is to insure that the devices for warning highway traffic of an approaching train are in proper condition. Tests should be made weekly to determine if lights, bells, and gates operate as intended.

At some locations this can be done with train on operating section, while at others it will be necessary to make a manual test by releasing the relays in the proper sequence.

Particular attention should be given to locations where timing sections are in effect and any irregularities reported to Signal Supervisor.

When roadway gate arm is replaced, torque test shall be made in accordance with Manufacturer's Instructions.

137.29a - TORQUE TESTS AND OPERATING CHARACTERISTICS - Test in accordance with manufacturer's instructions and special instructions issued by Signal Engineer's Office.

137.30 - OVERLOAD RELAYS, SWITCH MACHINE - The purpose of this test is to determine that overload relay will cut current off from switch motor when switch is obstructed.

Overload relay shall pick up within time limit as specified in Manufacturer's Instructions.

In making this test switch points should be obstructed with at least a one-inch obstruction to prevent damage to lock rod.

137.30a - SWITCH MACHINE CONTROLLER OR RELAY - Make operating tests of all electromagnetic devices used in connection with control of switch machine.

See Manufacturer's Instructions.

137.31 - BRAKES, SWITCH MACHINE - The purpose of this test is to insure that machine will not overrun causing damage to parts.

After machine has completed its movement insert hand crank and release brake. Turn crank until machine bumps. This should require at least one and one-half turns on low voltage machines and one-half turn on high voltage machines.

Test each machine in both normal and reverse positions.

If adjustments are required see Manufacturer's Instructions.

137.31a - BRAKES, ALL TYPES, SWITCH MACHINES - Test operating characteristics and adjustments as per Manufacturer's Instructions.

137.32 - CLUTCHES, SWITCH MACHINES - The purpose of the clutch is to absorb shock in case of obstruction in the switch points, overrun or failure to lock.

Place an obstruction in switch points and operate machine toward that position. Observe that clutch slips before overload relay picks up or power disconnected. Slippage can also be determined by use of hand crank.

On machines equipped with resilient gear, insert hand crank and turn slightly to ascertain if springs are effective. After springs are compressed release crank and it should spring back.

137.32a - CLUTCHES, SWITCH MACHINES - Test for current required to slip clutch and adjust as per Manufacturer's Instructions.

137.33 - SERVICE TEST - The purpose of this test is to insure that circuits conform to approved circuit plans.

Person making this test will personally check circuit plans for correctness before making test.

Test should be made of all circuits to insure that the opening of each contact in a control circuit cuts off the control current under conditions shown on plan, following through all multiple circuits and cut arounds. When a circuit is broken over a relay twice, or when it is broken over some other contact that will be opened by opening the relay the wires in the circuit must be disconnected for test in addition to the opening of the relay.

Check should be made as to condition and adjustment of spring combination, segments, electric locks, and circuit controllers.

When making this check and test, if conditions are observed in which the approved plans do not seem to provide proper protection or flexibility of operation, such conditions shall be reported to the Signal Engineer.

Employee making service test will notify his supervisory officer by letter if installation is in accordance with approved circuit plans and date completed.

This test and all applicable tests as shown on current Instructions I-120 shall be made before or immediately after apparatus goes in service.

All tests possible shall be made before placing in service.

When placing an interlocking plant in service and prior to completion of tests, trains or engines will not be moved until the person in charge on the ground knows that each switch, derail and movable point frog in the route to be used is in proper position and spiked.

Home signal must not display an aspect more favorable than "Proceed at Restricted Speed", and approach signal must not display an aspect more favorable than "Approach".

All movements will be made in this manner until the inspector or person in charge is satisfied that tests are completed and apparatus is safe for operation.

137.34 - SPRING SWITCHES - See Definition 136.822 - The purpose of this test is to insure that operating mechanism will move the switch points to the closed position.

See Pettibone Mulliken pamphlet covering description, installation and maintenance, and current Instructions for Spring Switch, I-153.

137.34a - SPRING SWITCH, COMPRESSION GAUGE - Check switch point pressure with spring switch compression gauge in accordance with Manufacturer's Instructions and current Instructions for Spring Switch, I-153.

137.35 - TRAFFIC CONTROL SYSTEM - See Definition 136.828 - Test in accordance with Form F-100-A, Shts.1 and 2. For Manufacturer's Instructions refer to G.R.S. Handbooks No. 30 and 42 for Type K, Handbook No. 45 for Type K2, and Handbook No. 46 for Syncrostep.

137.35a - TRAFFIC CONTROL - ALL SYSTEMS - Test in accordance with I.C.C. Rules 136.377, 136.378, 136.379, 136.380, 136.383, 136.385, and 136.386.

See B&O Rules 137.17, 137.18, 137.19, 137.20, 137.22, 137.25, and 137.26 for methods of testing.

For test purposes in traffic control territory each group of operated switches and signals is to be considered a separate interlocking.

137.36 - SWITCH REPEATER RELAY TEST - The purpose of this test is to insure that switch repeating circuits are wired in accordance with approved plans, circuit controllers and point detectors properly adjusted, and that relay properly corresponds with the position of switch.

Determine by observation that "WP" relay releases at proper time when circuit controller or point detector is adjusted in accordance with I-137.8 or I-137.8a.

Where "WP" relay checks more than one switch, out-of-correspondence test must be made.

Place one switch in full normal position while the other switch, switches, or derail are in full reverse position and vice-versa. "WP" relay must not pick up.

On electric machines this can be accomplished by using hand crank.

On electro-pneumatic machines this can be accomplished by barring the switches.

On mechanical machines where two switches or one switch and derail are operated from one lever it will be necessary to disconnect one switch or circuit controller.

On mechanical machines where signals are controlled by C.T.C. levers on panels and "WP" relay circuits are selected over mechanical switch and lock lever, connect a 400 or 1000 ohm polar relay across "WP" circuit where circuit enters tower. Operate switches observing that temporary relay is in correspondence with "WP" polar or biased relay. Then proceed with test as outlined.

Where "WP" circuit selects over levers in tower perform service test in accordance with I-137.33.

Perform applicable tests on hand-thrown switches equipped with "WP" circuits.

Determine that a proceed indication cannot be displayed on a signal when the "WP" relay is de-energized.

Numerous hand-thrown crossovers are equipped with a combination circuit.

With crossover unoccupied and switches normal, circuit repeats the normal position of the switches. With crossover occupied and switches normal, circuit becomes a track circuit and shunt by car or locomotive prevents "TR" relay from picking up.

This circuit is adjusted by means of an adjustable resistor in series with "TR" relay.

With coil wire removed from "TP" relay circuit functions as a track circuit.

Test as follows:

Remove "TP" coil wire.

With ammeter measure current from battery and current through "TR" relay.

Current from battery should not exceed the current through "TR" relay by more than .140 ampere.

If current differential is more than .140 ampere, circuit is improperly adjusted, ballast is fouling the crossover rails or insulated joints are partially broken down.

137.37 - AUTOMATIC INTERLOCKING TEST - Test to make certain that:

(a) When any track circuit between home signals on any route is shunted, home signals for all conflicting routes, and for the route shunted, cannot be cleared.

(b) By opening or shunting approach track circuit no conflicting signal can be cleared. (Test must be made for each signal and route.)

(c) When each track circuit is shunted in sequence to correspond with the passage of a train on each route, the interlocking is released as the rear of train leaves the interlocking.

(d) Manual release circuit operates properly. (Clear signal for a route, then shunt approach of conflicting route and operate manual release. Test must be made for each signal and route.)

(e) Aspects of operative approach signals are in accord with the position of the home signals.

(f) Adjustment, inking and operation of graphic time recorders, where used, are correct.

(g) A loss of shunt of 5 seconds or less on an approach circuit will not permit an established route to be changed.

137.50 - Relay shall not be tilted or turned over to close contacts. Contacts of relay or other controlling device shall not be bridged without taking proper measures to insure safe operation of trains.

137.51 - Tests shall be made immediately when repair, adjustment, change or replacement is made in any part of the system to determine that proper operation is assured.

137.52 - When making test of apparatus proper instruments shall be used, and it must be known that no unsafe conditions are set up by the application of testing equipment.

137.53 - In case of broken rail, wide gauge or any condition which may affect safety of train operation, steps shall be taken immediately to protect trains by flag, signals, or other controlling devices.

137.54 - In case of accident in which signal apparatus or other controlling device is concerned, a thorough examination shall be made immediately of all parts involved and record made of the results of such examination.

137.55 - When adjusting or working on electric mechanism energy must be cut off the motor either by opening motor circuit, lifting motor brush or removing fuse. On E.P. apparatus remove energy from control magnets.

137.56 - Mechanism must be operated by hand after making adjustments to see that it operates properly and without undue strain on any part before being operated by power, and then by power from the control point for checking operation after making adjustments.

137.57 - Commutator must be smooth, clean and have a glossy appearance. To clean, lift brushes from commutator and use chamois or cloth free from lint and abrasives, moistened, if necessary, with pale semaphore oil, and then wipe commutator dry with dry chamois or cloth. Abrasives or files must not be used on commutators.

137.58 - Brushes must be kept clean, fitted to commutator, free in brush holder, or brush holder free on stud. Springs must be in place and so maintained that brushes will have proper bearing and pressure. When installing new brushes they should be placed in position and carefully seated on the commutator by placing No. 000 or finer sandpaper against the commutator, and while pressing brush oscillate sandpaper with commutator. Burrs must be removed from the brush. When finished, all sand and dust must be removed.

137.59 - Air Compressor intakes must be kept clean and free from dirt and moisture. Intake must not be close to the ground, inside of buildings or where moisture accumulates. Nothing should be done which might obstruct or increase the resistance of air intakes.

137.60 - Air distribution system shall be so maintained that leakage in any section of the plant shall not exceed one pound in one minute from normal pressure with all apparatus connected and at rest.

137.61 - Air Strainer used between air distribution system and air apparatus shall be cleaned frequently enough to avoid air pressure reduction.

137.62 - Special attention must be given to drainage of condensation from air systems throughout the period of the year when temperatures are above freezing so as to avoid interruptions during cold weather.

137.63 - Oil used in piping systems or internal parts of valves, cylinders and other apparatus, must be of a grade which will not disintegrate nor injure leather and similar packing.

137.64 - Inside of pipe and fittings must be kept free from iron cuttings, scale, dirt, paints, or pipe joint compounds.

137.65 - Operating mechanisms must be lubricated in accordance with Manufacturer's Instructions.

137.66 - Signal blade, lens, roundels, and lamps shall be cleaned as often as necessary to insure good indications. Signal lamps shall be focused and lamp bulb filaments properly aligned.

137.67 - Ladder, hand railing, and platform shall be kept in good condition and securely fastened.

137.68 - In light signal, other than searchlight type, changes in the internal parts, including the lamp receptacle, shall not be made from their original settings, except where provision had been made for focusing.

137.69 - Deflecting prisms shall be assembled and maintained to spread the light in the proper direction.

137.70 - Interlocking or control machine, switch movements, and other equipment shall be kept in good condition, free from excessive lost motion, rust, grease and dirt. Levers and locking shall be kept clean. All bearing parts shall be kept lubricated, but excessive lubrication should be avoided. Bolts and dowel pins shall be kept tight, cotters properly spread, and sufficient tension in latch springs. Contacts shall be kept clean and properly adjusted.

137.71 - Cranks, compensators and other mechanical connections shall work freely, but shall not have excessive lost motion in moving parts. They shall be kept clean, properly centered, lubricated and in alignment.

137.72 - Gaskets for housings must be in place, in good condition, of proper size, resistant to water, and provide a weatherproof and dustproof seal.

Approved: ARiley
Chief Engineer

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
B. & O. RULES, STANDARDS
& INSTRUCTIONS
Office of Signal Engineer
Baltimore, Md.
June 25, 1957
Rev. May 18, 1959

1. **GENERAL**

(a) The following form a part of these instructions.

1 - Drawing S-107 - Layout for Dummy Inductor.

2 - Drawing S-109 - Inductor Layout.

3 - Instructions I-136.576.

4 - General Railway Signal Company Handbook No.6.

2. **TESTS**

(a) Height and Alinement. (All roadway, test, and dummy inductors).

1 - Inductors shall be gaged monthly.

2 - The center of wound inductor shall be maintained 19½ inches from and parallel to the gage line of rail ± 1/4 inch.

3 - The near edge of dummy inductor shall be maintained 16 inches from and parallel to the gage line of rail ± 1/4 inch.

4 - The top of wound inductor pole faces, and dummy inductors, shall be maintained 2½ inches above the plane of the top of rail ± 1/8 inch.

(b) Electrical. (Except wound test inductors)

1 - Wound inductors shall be tested semi-annually, (April and October).

2 - Resonance test shall be made in accordance with Manufacturer's Instructions.

3 - Inductors shall be replaced if the percentage of resonance is less than 60 or more than 90.

4 - Form 968-P-Rev. shall be used for recording inductor tests. If an inductor does not meet requirements it shall be replaced. Test of replacement inductor shall be shown on subsequent Form 968-P-Rev.

5 - The external resistance of the inductor control circuit,. including the resistance of relay and signal circuit breaker contacts, should not exceed 2 ohms.

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR AUTOMATIC TRAIN STOP INDUCTORS

Office of Chief Engineer Communications & Signals
Baltimore, Md.
Dec. 21, 1950.

(c) Inductor Coils and Circuit Efficiency.

1 - The following tests refer to circuit arrangement shown in Figure 1 and 2.

2 - Use one cell of Edison Storage battery having a voltage of not less than 1.3 under load.

3 - With milliammeter in series with battery, 1 ohm resistance unit, and inductor circuit with strap "A" open, reading should be between 200 and 350 milliamperes. With inductor coil shorted at "X", meter. reading should be not less than 450 millfamperes.

4 - Open 90° contact spring on signal mechanism and contact finger on each control relay. Each in turn should cause meter to indicate zero.

5 - With inductor circuit closed and megger connected at "B" reading should be 10,000 ohms plus. If less than 10,000 ohms, investigate and correct cause of low insulation resistance to ground. If cause of low insulation resistance is in the inductor winding, the inductor shall be replaced.

6-- Wires disconnected from the inductor should megger n less than 1 megohm. Wires having an insulation resistance less than 1 megohm shall be renewed.

FIG. I

TYPICAL CIRCUIT FOR C.P.L. SIGNAL

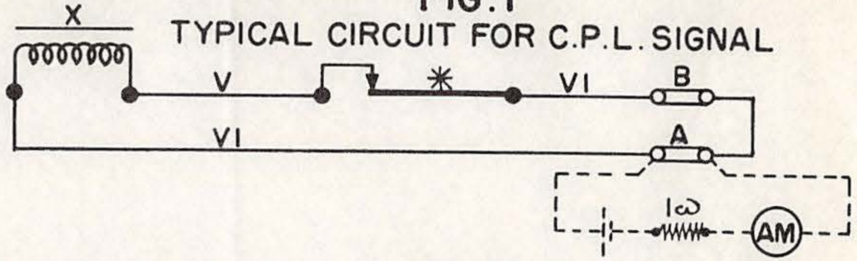
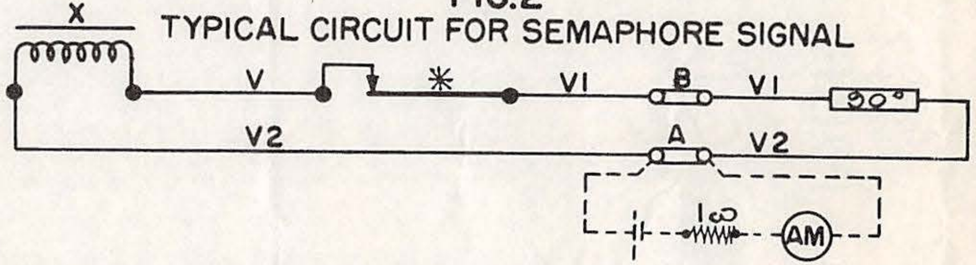


FIG. 2

TYPICAL CIRCUIT FOR SEMAPHORE SIGNAL



✳ "D" Relay or equivalent. On semi-automatic signal additional control relays may be included in inductor circuit.
Dotted lines cover test connections.

Approved: ____________
Chief Eng'r. Maintenance

Approved: ____________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR AUTOMATIC TRAIN STOP INDUCTORS
Office of Chief Engineer Communications & Signals
Baltimore, Md.
Dec. 21, 1950

1. GENERAL

(a) The following form a part of these instructions.

1. Drawing S-107 - Layout for Dummy Inductor.
2. Drawing S-109 - Inductor Layout.
3. Instructions I-136.576.
4. General Railway Signal Company Handbook No. 6, Third Edition.

2. TESTS

(a) Height and Alignment. (All roadway, test, and dummy inductors.)

1. Inductors shall be gaged monthly.
2. The center of wound inductor shall be maintained 20-3/4 inches from and parallel to the gage line of rail ± 1/4 inch.
3. The near edge of dummy inductor shall be maintained 17-1/4 inches from and parallel to the gage line of rail ± 1/4 inch.
4. The top of wound inductor pole faces, and dummy inductors, shall be maintained 2-1/2 inches above the plane of the top of rail ± 1/8 inch.

(b) Electrical.

1. Wound inductors shall be tested semi-annually (April and October).
2. Form 968-P-Rev. shall be used for recording inductor tests. If an inductor does not meet requirements it shall be replaced. Test of replacement inductor shall be shown on subsequent Form 968-P-Rev.
3. The external resistance of the inductor control circuit, including the resistance of relay contact, should not exceed 2 ohms.

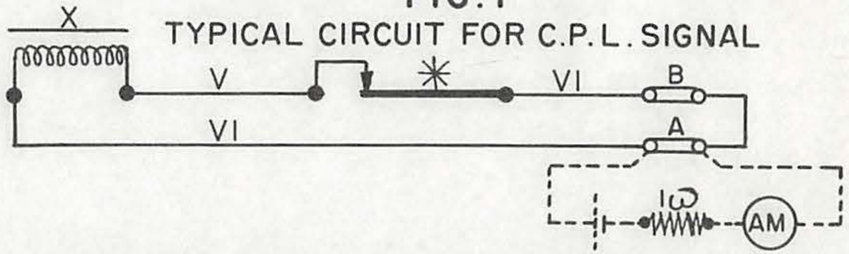
BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR AUTOMATIC
TRAIN STOP INDUCTORS
Office of Signal Engineer
Baltimore , Md.
July 21, 1958.
Sheet No. 1

I-138-B

(c) Inductor Coils and Circuit Efficiency.

1. The following tests refer to circuit arrangement shown in Figure 1.
2. Use one cell of Edison storage battery having a voltage of not less than 1.3 under load.
3. With milliammeter in series with battery, 1 ohm resistance unit, and inductor circuit with strap "A" open, reading should be between 200 and 350 milliamperes. With inductor coil shorted at "X", meter reading should be not less than 450 milliamperes.
4. Open contact finger on each control relay. Each in turn should cause meter to indicate zero.
5. With inductor circuit closed and megger connected at "B", reading should be 10,000 ohms plus. If less than 10,000 ohms, investigate and correct cause of low insulation resistance to ground. If cause of low insulation resistance is in the inductor winding, the inductor shall be replaced.
6. Wires disconnected from the inductor should megger not less than 1 megohm. Wires having an insulation resistance less than 1 megohm shall be renewed.

FIG. I
TYPICAL CIRCUIT FOR C.P.L. SIGNAL



✱ *"D" Relay or equivalent. On semi-automatic signal additional control relays may be included in inductor circuit.*

Dotted lines cover test connections.

Approved: A Riley
Chief Engineer
Construction & Maintenance

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR AUTOMATIC
TRAIN STOP INDUCTORS
Office of Signal Engineer
Baltimore, Md.
July 21, 1958.
Sheet No. 2

First issued - Dec. 21, 1950
Revised and retyped - July 21, 1958

1. HOUSING

(a) Cells must be protected against rain, snow, extreme heat or cold and should be kept clean.

(b) Where freezing temperatures prevail for prolonged periods, outside housing shall be provided with frost covers and buried to such depth that the frost covers will be at or below the ground level.

(c) Drainage must be provided to prevent flooding.

(d) Cells must be set level on floors, shelves or racks. Where required, provision must be made to keep cells from shifting.

(e) The air depolarized cell gives best results where plenty of fresh air is available, therefore normal ventilation must be provided in battery housing. Screened opening, shielded to prevent rain or snow from entering the housing, will be sufficient.

(f) The renewable 500 ampere-hour air depolarized type primary cell should not be placed in service or operated under conditions where the battery will be subjected to extremes of heat, cold, or dampness.

2. MATERIAL

(a) 1. One complete cell (except water) must consist of the following:

1 - jar of heat resisting glass.
1 - special cover with air vent.
1 - complete renewal.
1 - hexagonal nut.
2 - wing nuts.
2 - washers.

2. One complete renewal must consist of the following:

1 - element.
1 - can caustic soda.
1 - bottle battery oil.

(b) Renewals must not be removed from container until required.

(c) Make certain the elements have no broken or misplaced parts due to damage in shipment.

(d) Elements must not be lifted or carried by their connecting wires.

(e) Renewals must be kept dry.

(f) Caustic soda which has been damaged by exposure to air or dampness must not be used.

(g) Renewals on hand for the longest period of time must be used first.

3. SETTING UP AND RENEWING CELLS

(a) Material must be checked to see that jars, covers, nuts, washers, elements, caustic soda and oil are of proper size and quantity.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
AIR DEPOLARIZED TYPE
Office of Signal Engineer
Baltimore , Md.
June 28, 1957

Sheet No. 1 I-139-A

(b) Separators and other packing material must be removed from elements.

(c) Elements must be examined to see that they hang approximately in a vertical position, that the electrodes are parallel to each other and uniformly spaced, and that connections are firmly made. Broken or cracked electrodes must not be used.

(d) Jars and covers must be thoroughly cleaned. Cracked or defective jars or covers must not be used.

(e) Material unfit for use must be reported to Signal Supervisor and held for instructions.

(f) Clean water must be used for mixing the solution; water known to contain acid, alkali, sewage or other impurities must not be used.

(g) Jars must be filled with clean water to within 2-3/4" from the top or as specified in manufacturer's instructions.

(h) Open can of caustic soda and gradually add contents into jar; mix thoroughly before soda has time to cake in bottom of jar. Stir solution in a circular and pendulum like motion with a clean narrow wooden stick long enough to reach the bottom of the jar. Be sure all soda is used and stirred until thoroughly dissolved.

(i) The entire can of caustic soda, and only that furnished by the manufacturer for the type of renewal, must be used in each cell.

(j) Before applying element to cover, bend connecting lead wire so that it will pass freely through hole in cover to prevent damage to insulation. Be sure that lead wire passes through its own cover hole and not through oil hole or ventilator hole. When passing the lead wire through the cover opening, the suspension bolt must also be passed through its cover opening, then run down hex nut against cover and follow with two washers and two wing nuts.

(k) Element must be inserted in solution, where practicable, after jars have been placed in a permanent position. This should be done immediately while solution is still hot. When necessary, water must be added to bring top of solution about 5/8 inch from top of jar and stirred thoroughly by agitating entire bulk of solution by a brisk pendulum movement of narrow stick reaching to bottom of jar. Solution must not touch underside of cover but must be well above top of electrodes. Insufficient stirring of solution will result in lower voltage or shorter life and will be indicated by premature dissolving of the lower portion of zinc plates due to the solution in lower part of jar being more concentrated.

(l) Pour contents of one oil bottle down the oil hole in the cover. Do not do this until level of the hot solution is known to be correct because it is detrimental to lift the element through the oil and add and re-stir more water. Do not short circuit cell.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
AIR DEPOLARIZED TYPE
Office of Signal Engineer
Baltimore, Md.
June 28, 1957

(m) While the cell is in service, should the solution fall to one inch below the top of jar, not counting the oil which is always on top of the true solution, add water through oil hole to correct it to 3/4 to 7/8 inch. These small additions do not require stirring.

(n) Cells must be arranged to permit ready inspection of each cell or element. Element must not be raised into oil for inspection.

(o) Cells must be connected as required by plans and instructions. Connections must be clean and tight and must not be changed without proper authority.

(p) Battery performance shall be recorded on Form 920A.

(q) Except when necessary to make replacements of defective cells, all cells of a battery must be renewed at the same time.

(r) When renewing or installing cells, care must be taken not to interfere with train operation.

(s) Use extreme care in handling dry soda or mixed solution because caustic soda is a caustic poison which will burn or injure the skin, eyes, or clothing. It must never be taken internally. If caustic soda is splashed on skin or clothing it should immediately be washed off with plenty of water and neutralized with weak acid, such as vinegar - or a 5% solution of acetic acid. If skin is burned from contact with caustic soda, apply sterile dressing and see a physician. In case caustic soda should get into dyes, immediately wash with plenty of water, flush freely with a pure vegetable oil, olive oil, and see a physician as soon as possible. If clothing becomes wet with caustic soda solution it should immediately be removed. If the wet portion came in contact with the skin, the skin should be treated as recommended above. Such clothing should be thoroughly washed before it is worn again.

(t) Discarded solution, cans and bottles, must be disposed of where they will not damage property, inflict injury to persons, animals, etc., nor pollute any stream or source of water supply. Cans should be flattened out when emptied.

4. INSPECTIONS AND TESTS

(a) Batteries must be inspected, tested and renewed as often as necessary to prevent failures. Voltage readings must be taken under full load to check their condition.

(b) Broken or cracked jars and covers must be replaced promptly.

(c) Jars and covers must be clean and connections tight and free from corrosion.

(d) Any unusual appearance or performance of cells must be promptly reported to Signal Supervisor.

(e) When either elements or solution are defective, complete cell must be removed and saved intact on open circuit for investigation, and Signal Supervisor promptly notified.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
AIR DEPOLARIZED TYPE
Office of Signal Engineer
Baltimore, Md.
June 28, 1957

5. EXHAUSTED ELEMENTS

Exhausted elements are not to be saved for return to the manufacturer. These exhausted elements are to be disposed of where they will not damage property or inflict injury to individuals and animals. One of the best ways to dispose of these exhausted elements is to bury them below the surface of the earth where this is practicable.

Approved: ________________
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR CAUSTIC SODA BATTERIES
AIR DEPOLARIZED TYPE
Office of Signal Engineer
Baltimore, Md.
June 28, 1957

Issued - March 14, 1951
Retyped - June 28, 1957

GENERAL INSTRUCTIONS FOR OPERATING EXIDE MODEL 6 CAT. 39215 CELL TESTER.

A- Record specific gravity of all cells and electrolyte temperature of one cell.

B-MAKE SURE THAT SWITCH IS OPEN. With plugs in the unnumbered jacks and all wing nuts turned up against stops, connect lead clips securely to the cell posts with proper polarity.

C- Read and record the cell voltage.

D- Insert plugs and/or turn down wing nuts snugly on bus as indicated by tables 1 or 2, for type and size cell to be tested.

E- Close the switch and allow cell to discharge for one minute. Then read voltmeter and open switch. Record voltage reading.

F-DO NOT REMOVE CLIPS WHILE SWITCH IS CLOSED.

G- If voltmeter needle does not drop below voltage point on scale corresponding to electrolyte temperature of cell, the cell has passed the test and should be kept in service.

If the voltmeter needle drops below voltage limit point
(1) Give cell a sufficient overcharge and retest.
(2) Replace cell if after overcharge, it does not pass test.

TABLE 1

TYPE CELL	INSERT AND/OR TURN DOWN	NUMBER OF PLATES PER CELL							
		3	5	7	9	11	13	15	17
BTMP	Plugs Wing Nuts	2 —							
CTMP	Plugs Wing Nuts	3 —							
DMGP	Plugs Wing Nuts	2&3 —	2 A						
KXHS	Plugs Wing Nuts		3 A	2 B	1 AB	1 D	1 AD	2 BD	3 ABD
DMGO	Plugs Wing Nuts		3 A	2&4 A	2&3 B				

TABLE 2

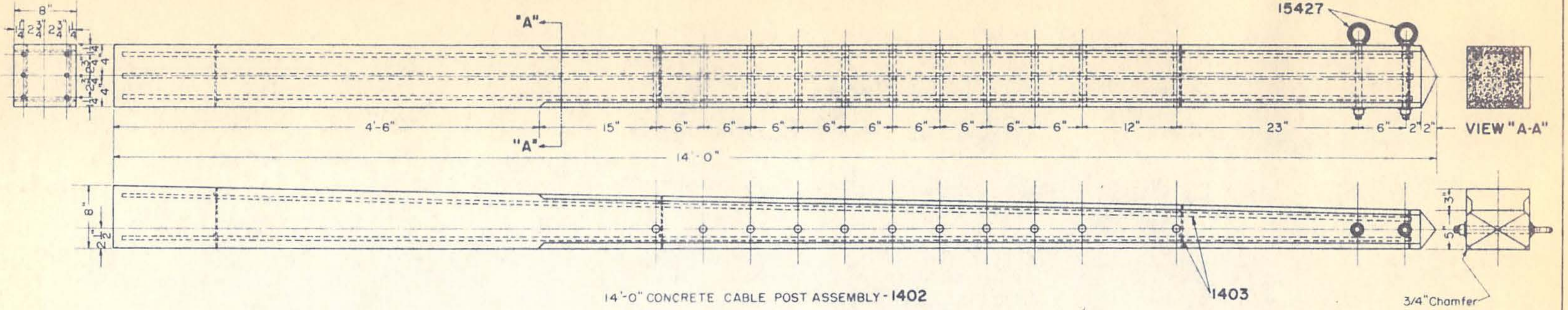
TYPE CELL	INSERT AND/OR TURN DOWN	NUMBER OF PLATES PER CELL							
		3	5	7	9	11	13	15	17
EM, EMGO EMGS	Plugs Wing Nuts		1&3 B	2&4 AB	1&3 AD	2&4 ABD	2 BCD		
DME	Plugs Wing Nuts		2&3 A	1&3 B	1&3 AB	2&3 D	2&4 AD	1&3 ABD	3 ACD
DMP	Plugs Wing Nuts		2&3 A	2&3 A	2&3 AB				
EME or EP	Plugs Wing Nuts					1&4 ACD	#2&4 ABCD		
EP	Plugs Wing Nuts		1&3 AB	1&3 AD	1&3 ABD				
EMP	Plugs Wing Nuts		1&3 AB	2 AD	2&3 ABD	2&4 BCD			

#Test for 2 minutes

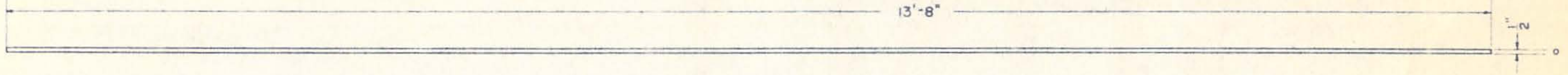
Approved : A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR BATTERY CELL TESTER
Office of Signal Engineer
Baltimore, Md.
June 11, 1958.

Issued - 3-19-51.
Remade -6-11-58, DMP & EMP added.



14'-0" CONCRETE CABLE POST ASSEMBLY - **1402**



1/2" DIA. ROUND CONCRETE BAR - **1403**
(6 - Required)

NOTES

1- All holes cored 7/8" dia.

2- Concrete shall conform to the following,

(a) Coarse aggregate shall consist of 3/4" maximum size stone or gravel.

(b) Not less than 7 sacks of cement shall be used per cubic yard of concrete.

(c) Water content per 94 lb. sack of cement shall not exceed 6 gallons.

(d) High frequency vibrator shall be used in compacting concrete.

3- Unless otherwise specified cable post shall be furnished with only one eye bolt.

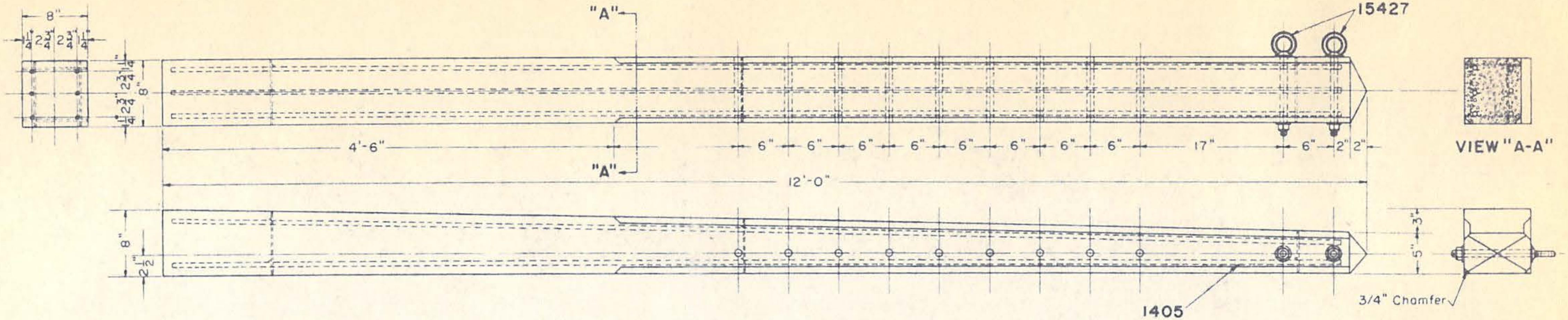
Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CONCRETE CABLE POST
Office of Signal Engineer
Baltimore, Md
Jan 2, 1951

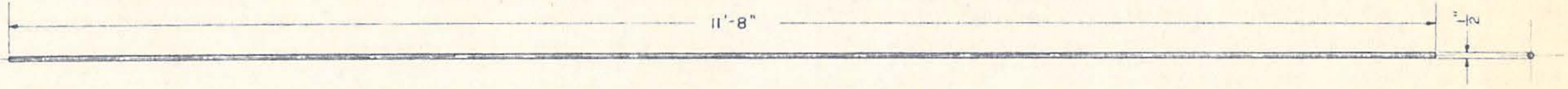
Adopted 5-16-51
Revised 3-25-53, account concrete bars changed
Revised 3-30-55
Revised 5-17-55

Sheet No. 1

S-140-B


8"
1¼ 2¾ 2¾ 1¼
1¼ 2¾ 2¾ 1¼
8"
"A"
"A"
15427
4'-6"
6"
6"
6"
6"
6"
6"
6"
6"
17"
6"
2"
2"
VIEW "A-A"
12'-0"
8"
2½"
5"
3"
1405
3/4" Chamfer

12'-0" CONCRETE CABLE POST ASSEMBLY - **1401**



1/2" DIA. ROUND CONCRETE BAR - **1405**
(6-Required)

NOTES:

1- All holes cored 7/8" dia.

2- Concrete shall conform to the following,

(a) Coarse aggregate shall consist of 3/4" maximum size stone or gravel.

(b) Not less than 7 sacks of cement shall be used per cubic yard of concrete.

(c) Water content per 94 lb. sack of cement shall not exceed 6 gallons.

(d) High frequency vibrator shall be used in compacting concrete.

3- Unless otherwise specified cable post shall be furnished with only one eye bolt.

Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CONCRETE CABLE POST
Office of Signal Engineer
Baltimore, Md.
Jan. 2, 1951

Adopted 5-16-51
Revised 3-25-53, account concrete bars changed.
Revised 3-30-55.
Revised 5-17-55

Sheet No. 2

S-140-B

Issued-July 25,1956.
Retyped & Syncrost[illegible]dded-6-18-58.
Halethorpe to Curtis Bay (K)
Martinsburg to Hobbs (K)
Keyser to Piedmont (K)
Berkley Run Jct. to Berryburg (K)
Grafton to Parkersburg (K)

Confluence to Brook (K)
Newton Falls to Charlestown (K)
Chillicothe to Scioto Jct. and
Renick Jct. (K)
North Dayton to Lima (K2)

1. MAINTENANCE

a. Type K, Class M, CTC systems shall be maintained in accordance with G.R.S. Handbook 42, dated May 1952, except as modified by these instructions.

b. Type K2, Class M, CTC systems shall be maintained in accordance with G.R.S. Handbook 44, dated January 1954, except as modified by these instructions.

c. Syncrostep (Simplex System) shall be maintained in accordance with G.R.S. Handbook 46, dated October 1953, except as modified by these instructions.

2. PERIODIC SERVICE TESTS

a. Service tests as prescribed in G.R.S. Handbooks 42, 44, and 46 shall be made annually, preferably in April or October when the temperature of field apparatus is approximately 70 degrees, by the Leading Maintainer or designated Signal Inspector.

3. RECORD OF TESTS

a. Result of tests shall be recorded on Form F-100-A, Sheets 1 and 2, in quadruplicate, one copy to be retained by Leading Signal Maintainer and one copy each to be furnished Signal Engineer, Assistant Engineer Signals, and Division Engineer.

b. The Signal Engineer shall be furnished copy of tape recordings properly marked as to location when service tests are made.

4. CHANGING CTC RELAYS

a. When a relay is removed from service account poor timing, or is otherwise defective, it shall be sent to the relay shop for repairs.

5. GENERAL MAINTENANCE

a. Maintenance of Types K, K2, and Syncrostep CTC facilities, other than those covered by G.R.S. Handbooks 42, 44, and 46, shall be in accordance with standard practice and instructions.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

INSTRUCTIONS FOR THE MAINTENANCE & TESTING OF G.R.S. TYPE K ,K2,& SYNCROSTEP CTC SYSTEMS

Office of Signal Engineer
Baltimore , Md.
June 18, 1958.

1. MAINTENANCE

a. The cylinder of mechanical switchman shall be kept filled to oil level line at all times, using semaphore oil, B&O Stock No. 5922. Oil level line is at the bottom of the intake plug flange and may be checked by removing plug and screen.

b. Under no circumstances shall water be permitted to enter cylinder.

c. When pouring oil into cylinder, make certain that screen is in its proper place. Capacity of Model "B" mechanical switchman is thirteen pints.

d. In cold weather, condensation or moisture may accumulate in the cylinder and freeze, lodging in the small port opening in valves and prevent proper operation of mechanical switchman. To overcome this condition, one half pint of alcohol should be added at the time of refilling cylinder. Alcohol has a slight acid reaction that may, in some instances, cause a loosening of small particles of rust or scale. Therefore, the alcohol must be neutralized by adding one fourth teaspoon of baking soda to the one half pint of alcohol and thoroughly mixed. Then strain through a fine clean cloth before adding to the semaphore oil.

e. Entire switch should at all times be well surfaced, aligned and maintained to a high standard.

f. Switch shall be kept well cleaned and lubricated at all times and kept free from ice, snow and other obstacles.

g. Switch shall be checked weekly by maintainer to see that switch points close properly after being trailed through. This can also be done by placing block between open point and stock rail, throw switch stand, then knock out block after which switch points should return to their normal position, one of which is tight against stock rail. Repeat this test, except for reverse position.

h. Once each year, not later than November 1, the mechanical switchman should be replaced and sent to shop to be disassembled for cleaning in the following manner:

1. Drain oil from cylinder.
2. Remove packing nut.
3. Remove cap screws from end caps.
4. The piston rod, having operating mechanism mounted on it can now be withdrawn from cylinder.
5. Use a clean soft cloth, free from lint, and clean all parts mounted on piston rod, also inside cylinder walls using kerosene or gasoline.
6. Make certain that small ports in both valves are clean and open.
7. Defective or worn parts shall be replaced.
8. Do not attempt to remove pistons and springs from rod without suitable fixture. The spring and pistons are assembled at the factory under compression and of necessity must be compressed to be removed.
9. Replace old packing with new Garlock No. 530 asbestos packing.
10. The piston rod may have become bent in service, in which case it should be replaced with one that is straight.
11. If pitting of the piston rod is sufficient to score bushings or tear packing, it should be replaced with a new one.
12. Re-assemble mechanical switchman using new gaskets and refill with new semaphore oil, B&O Stock No. 5922. Strainer must be in place when refilling.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS
FOR SPRING SWITCH
Office of Signal Engineer
Baltimore, Md.
July 28, 1958

Sheet No. 1 I-153-A

h. CONTINUED

13. This work should be done in a manner and place that positively prevents moisture, dust, or any other foreign substances from entering cylinder.
14. The packing gland should be kept tight enough to prevent leakage of oil, but not so tight as to bind on piston rod and interfere with free movement of the switch.

2. COMPRESSION TEST (INSPECTORS)

a. Attach spring switch compression gauge by placing hooked end over the ball of the rail on the open point side, with the pump and plunger aligned to fit between the bolts attaching the switch rod clip to the point at the No. 1 rod, close valve on side of pump cylinder by rotating in a clockwise direction. Pump up sufficient pressure to open the closed point a small amount.

b. Insert a thin shim (.003" to .005" thick) between stock rail and closed point, release valve on pump cylinder by turning counterclockwise, thereby firmly grasping the shim between stock rail and closed point.

c. Close valve tightly by rotating in a clock-wise direction.

d. Pump gradually until the shim between closed point and stock rail begins to fall. At this point read pressure on gauge. Pressure shown will be that required to just open the points. This is called minimum pressure and should not be less than 1000 lbs., nor more than 2200 lbs. The minimum pressure should be read normal and reverse and recorded on Form 102.

e. The minimum pressure may vary for the following reasons:

1. Tight heel joints.
2. Insufficient lubrication or sand on plates.
3. Worn or out of surface plates.
4. Improper adjustment at connection to head rod.
5. Binding at rod, switch circuit controller or facing point lock.
6. Switch out of line and surface.
7. Lost motion due to wear in connections, etc.

f. When used at spring switches equipped with facing point locks, lock rods and springs at release rods, must be disengaged or blocked so as to exert no adverse effect.

g. Pressure read by the compression gauge is the total pressure exerted by the spring switch mechanism, varied by the above mentioned causes.

Approved: R R Riley
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS
FOR SPRING SWITCH
Office of Signal Engineer
Baltimore, Md.
July 28, 1958

ADOPTED: 11-18-52 - ISSUED: 12-4-52
RETYPED: 7-28-58

1. GENERAL

a. Rectifiers must be kept clean and dry.

b. Bolts, nuts, dowel pins, screws, binding posts, rivets, nut locks, and jam nuts must be kept in place, in good condition, and tight.

c. Rectifier shall be mounted with cooling fins vertical and must not be located where they are subjected to heat from other apparatus.

d. Alternating current shall be of voltage and frequency as specified on the name plate of the rectifier.

2. FIELD TEST

a. If it is necessary to frequently change the adjustment of the rectifier to maintain the required battery voltage when there is no appreciable increase in the battery load, test should be made to determine if normal field back-leak is in excess of value shown in column 9. The back-leak shall be determined by placing ammeter in D.C. charging circuit and noting current discharge from battery after A.C. supply has been disconnected. If the value obtained exceeds that shown in column 9 the A.C. supply should be left disconnected for one hour. If the back-leak value is still in excess of that shown in column 9, the rectifier should be replaced and the back-leak current reported on repair tag Form 260-V.

3. SHOP TEST

a. The number and kind of cells employed in normal back-leak test shall be as shown in column 6 for the particular rectifier being tested.

4. HOT BACK-LEAK

a. With A.C. supply, shown in column 1 connected, start charging battery at the maximum rated current shown in column 5, or as shown on name plate of rectifier. After one hour charging, disconnect the A.C. supply and immediately connect twice the D.C. voltage shown in column 6 to the D.C. terminals of the rectifier and determine discharge from the battery through rectifier. This current shall not exceed the value shown in column 7.

5. NORMAL BACK-LEAK

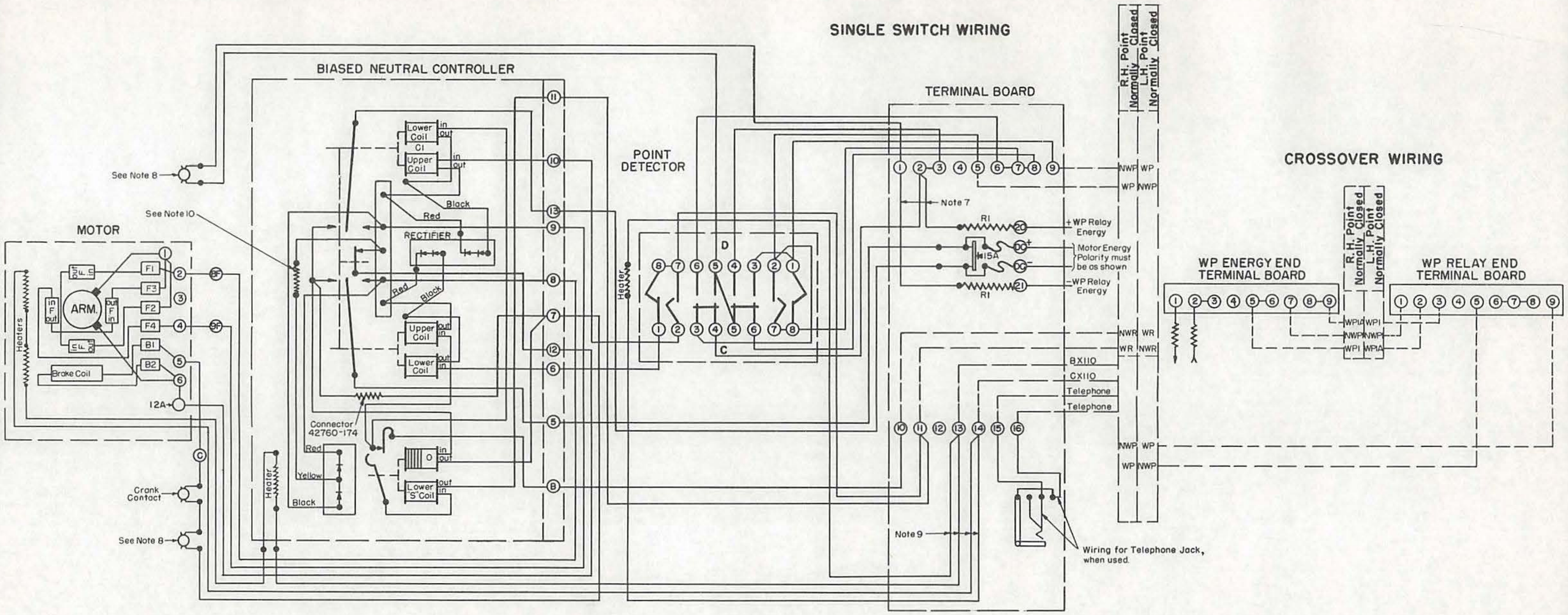
a. After determining the hot back-leak value with A.C. supply disconnected and with the battery as shown in column 6 connected, allow the rectifier and battery to stand for one hour; then determine discharge from the battery through rectifier. This current shall not exceed the value shown in column 8.

6. CAPACITY TEST

a. With A.C. supply shown in column 1 connected, and rectifier connected to the battery as shown in column 6, determine that minimum and maximum D.C. charging current shown in columns 4 and 5 respectively, or as shown on name plate of rectifier, can be obtained by means of adjustment provided with rectifier.

BALTIMORE & OHIO RAILROAD
INSTRUCTIONS FOR
DRY PLATE RECTIFIER
Office of Signal Engineer
Baltimore, Md.
Rev. July, 29, 1958

ISSUED: 8-31-53
RETYPED: 7-29-5


SINGLE SWITCH WIRING
BIASED NEUTRAL CONTROLLER
Lower Coil
C1
Upper Coil
in
out
Black
Red
RECTIFIER
See Note 8
See Note 10
MOTOR
ARM.
F1
F2
F3
F4
B1
B2
Heaters
Brake Coil
12A
C
Crank Contact
8F
9F
Upper Coil
Lower Coil
Connector 42760-174
Red
Yellow
Black
Heater
O
Lower "S" Coil
POINT DETECTOR
D
C
Heater
TERMINAL BOARD
Note 7
R1
+WP Relay Energy
15A
Motor Energy Polarity must be as shown
-WP Relay Energy
R.H. Point Normally Closed
L.H. Point Normally Closed
NWP WP
WP NWP
NWR WR
WR NWR
BX110
CX110
Telephone
Telephone
Note 9
Wiring for Telephone Jack, when used.
CROSSOVER WIRING
WP ENERGY END TERMINAL BOARD
WP RELAY END TERMINAL BOARD
WPIA WPI
NWP NWP
WPI WPIA

NOTES:

1- Connections are shown for Single Switch with R.H. Point normally closed as viewed from Point Detector End.
2- On Machines to operate BLOCK TYPE DERAILS transpose wires 8F and 9F to Motor Terminal posts 2 and 4.
3- When applying a machine to a crossover be sure to arrange terminal board metal connectors as shown.
4- All wires to Motor Terminal Block are tagged as shown.
5- Crank contact opens motor circuit when hand crank is inserted.
6- The "OUT" lead of all coils is the one nearest to tag.
7- "R1" Resistors and the two jumpers indicated are supplied only when required. Values of "R1" Resistors, when used, depends on voltage used for WP Relay.
8- These Contacts open when Selector Lever is placed in "HAND" position.
9- Wiring for Heaters is supplied only when required.
10- Resistor not required for 24 Volt operation.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

WIRING FOR 5D SWITCH MACHINE WITH BIASED NEUTRAL CONTROLLER & DYNAMIC SNUBBING

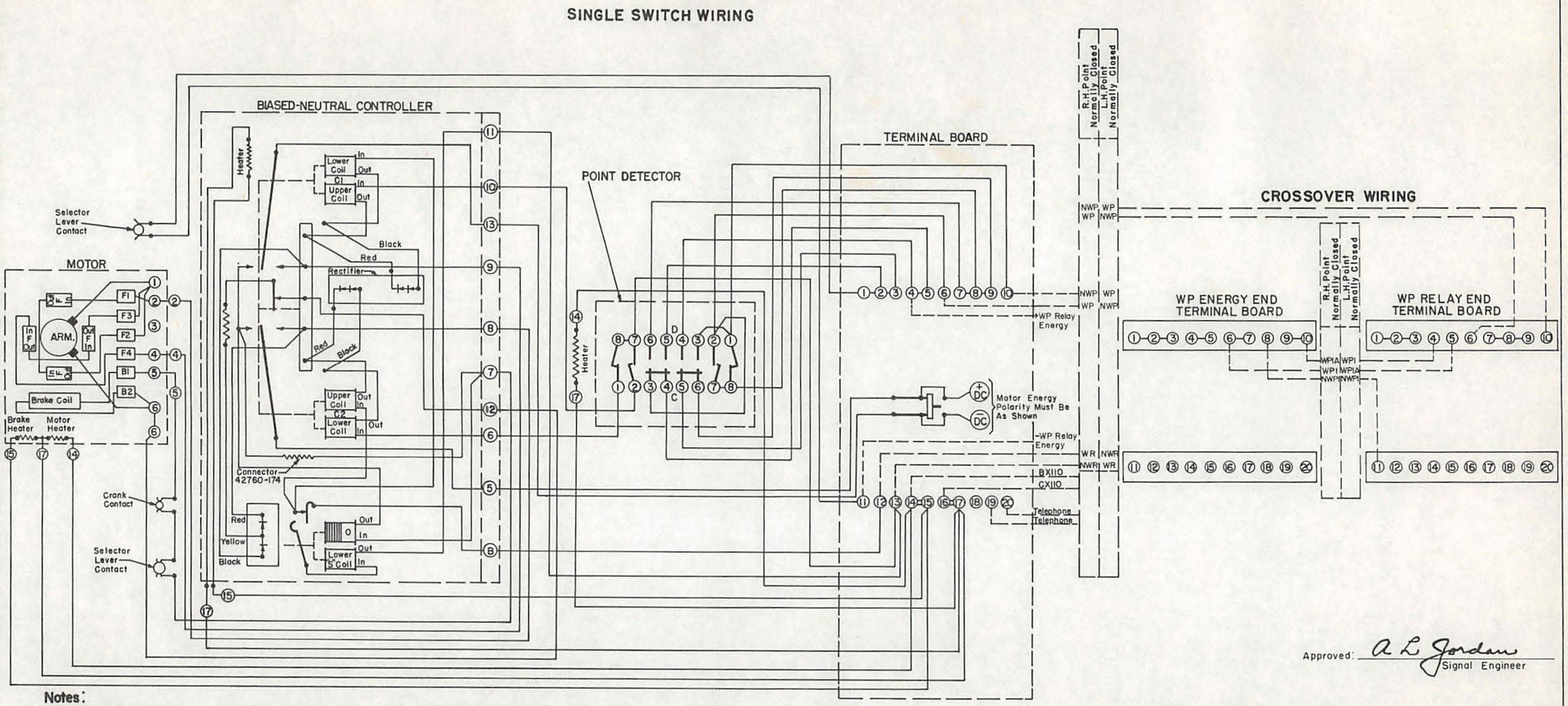
Office of Signal Engineer
Baltimore, Md.
July 24, 1958

Made & Corrected 3-13-53
Revised: 7-24-58

(PURCHASED PRIOR TO 1957)

Sheet No. 1

C-103-A


SINGLE SWITCH WIRING
BIASED-NEUTRAL CONTROLLER
Heater
Lower Coil
C1
Upper Coil
In
Out
Black
Red
Rectifier
Upper Coil
C2
Lower Coil
Connector 42760-174
Red
Yellow
Black
O
Lower S Coil
Selector Lever Contact
MOTOR
ARM.
F1
F2
F3
F4
B1
B2
Brake Coil
Brake Heater
Motor Heater
Crank Contact
Selector Lever Contact
POINT DETECTOR
Heater
D
C
TERMINAL BOARD
+WP Relay Energy
-WP Relay Energy
Motor Energy Polarity Must Be As Shown
DC
BX110
CX110
Telephone
Telephone
R.H.Point Normally Closed
L.H.Point Normally Closed
NWP
WP
WR
NWR
CROSSOVER WIRING
WP ENERGY END TERMINAL BOARD
WP RELAY END TERMINAL BOARD
WP1A
WP1
NWP1

Approved: A L Jordan
Signal Engineer

Notes:

1- Connections are shown for single switch with R.H.Point Normally closed as viewed from Point Detector end of machine.
2- On Machines to operate block type derails transpose wires ② & ④ on motor terminal post 2 & 4.
3- All wires to motor & for heaters are tagged as shown.
4- Crank contact opens motor circuit when hand crank is inserted.
5- The "OUT" lead of all Coils is the one nearest to tag.
6- Wiring for Heaters is supplied. Heaters to be added in field when required.
7- When required, install Heaters in accordance with G.R.S. Handbook No.24, 2nd Edition, Aug. 1957 as follows:
    For Brake refer to Fig. 1801, on Page 1803.
    For Motor refer to Fig. 1802, on Page 1804.
    For Controller refer to Fig. 1805, on Page 1805.
    For Contact Compartment refer to Fig. 1804, on Page 1805.

BALTIMORE & OHIO RAILROAD

WIRING FOR 5D SWITCH MACHINE
WITH BIASED NEUTRAL CONTROLLER & DYNAMIC SNUBBING

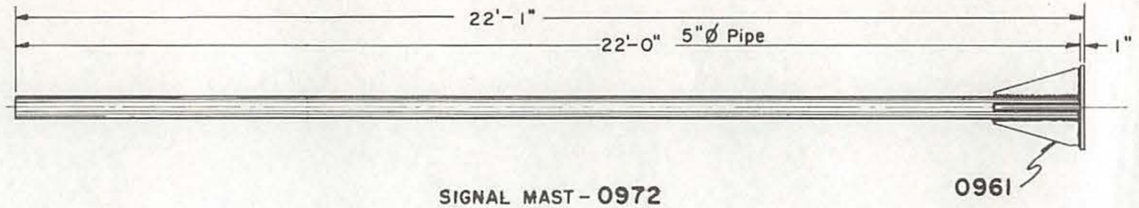
Office of Signal Engineer
Baltimore, Md.
July 24, 1958

W.J.G.

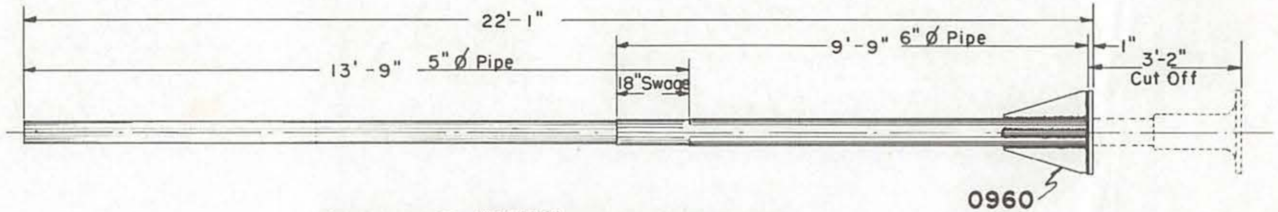
(PURCHASED AFTER 1957)

Sheet No. 2

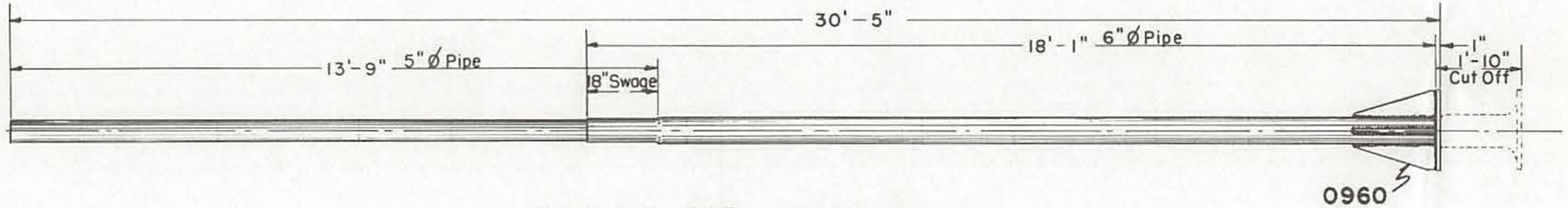
C-103-A


22'-1"
22'-0" 5"Ø Pipe
1"
0961

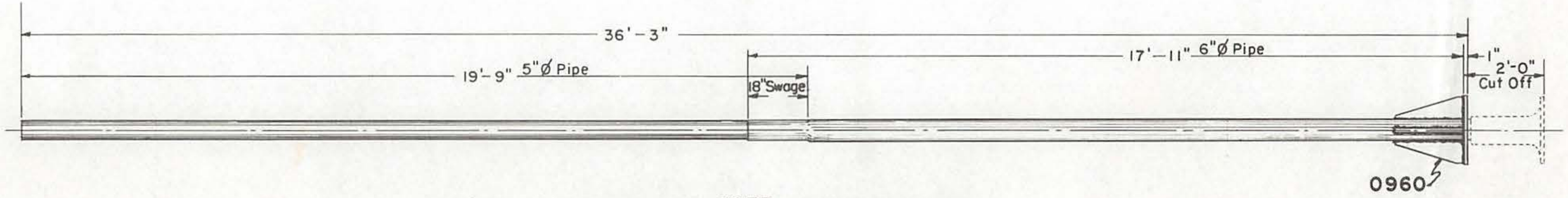
SIGNAL MAST - 0972


22'-1"
9'-9" 6"Ø Pipe
13'-9" 5"Ø Pipe
18"Swage
1"
3'-2" Cut Off
0960

SIGNAL MAST - 0972M (MODIFIED 103514, S-320).


30'-5"
18'-1" 6"Ø Pipe
13'-9" 5"Ø Pipe
18"Swage
1"
1'-10" Cut Off
0960

SIGNAL MAST - 0971 (MODIFIED 103515, S-320).


36'-3"
17'-11" 6"Ø Pipe
19'-9" 5"Ø Pipe
18"Swage
1"
2'-0" Cut Off
0960

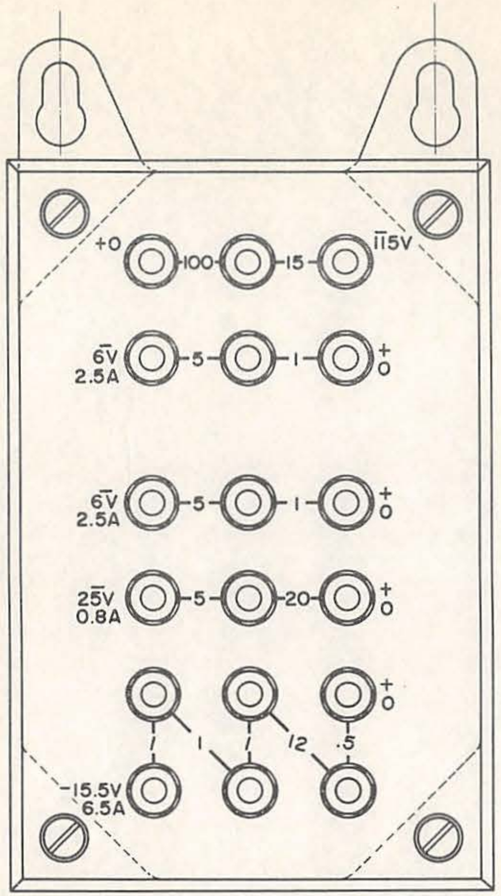
SIGNAL MAST - 0973 (MODIFIED 103516, S-320).

BALTIMORE & OHIO RAILROAD
MASTS FOR
COLOR POSITION LIGHT SIGNALS
Office of Signal Engineer
Baltimore, Md.
July 13, 1960

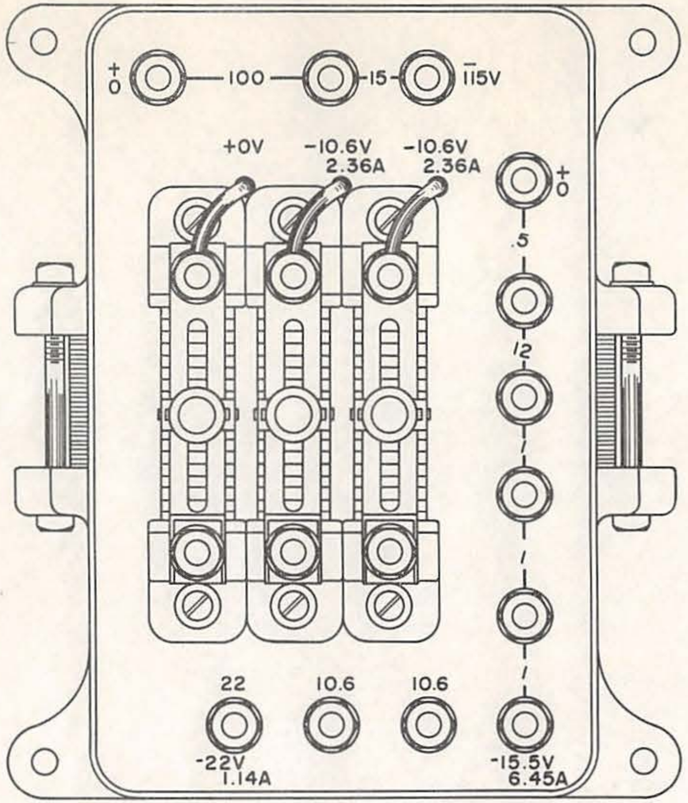
Approved: A L Jordan
Signal Engineer

Adopted 1-10-61.

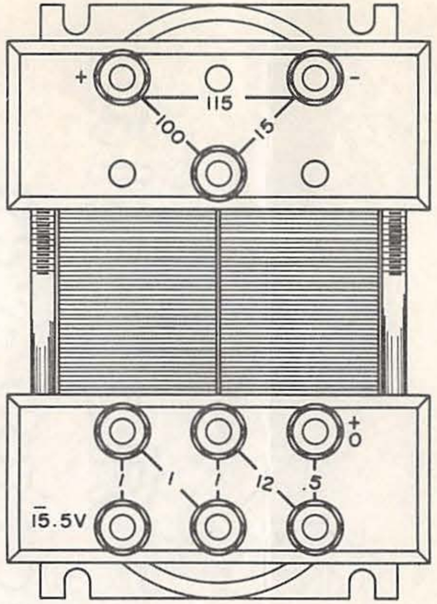
S-97


+0
100
15
115V
6V
2.5A
5
1
+
0
6V
2.5A
5
1
+
0
25V
0.8A
5
20
+
0
+
0
1
1
1
12
.5
-15.5V
6.5A

RECTIFIER AND LIGHTING TRANSFORMER FOR COPPER OXIDE OR SELENIUM RECTIFIER - **981**
Primary 100-115 Volts, 60 Cycle, .150 KVA.
(Type K. Size I. Class B. G.R.S. Drawing No. 38270 Gr. 2 Spec. 13C-282)


+
0
100
15
115V
+0V
-10.6V
2.36A
-10.6V
2.36A
+
0
.5
12
1
1
1
22
10.6
10.6
-22V
1.14A
-15.5V
6.45A

RECTIFIER AND LIGHTING TRANSFORMER FOR FANSTEEL-BALKITE TANTALUM RECTIFIER - **982**
Primary 100-115 Volts, 60 Cycle, .175 KVA.
(Type K. Size 2 Class B G.R.S. Drawing No. 38270-2 Gr. 11 Spec. 13D-72)


+
115
-
100
15
+
0
1
1
1
12
.5
15.5V

LIGHTING TRANSFORMERS
Primary 100-115 Volts, 60 Cycle, .200 KVA. - **983**
" " " " " " .300 " - **984**
" " " " " " .500 " - **985**

Approved: ______
Chief Engr. Comm. & Sigs.

NOTES:

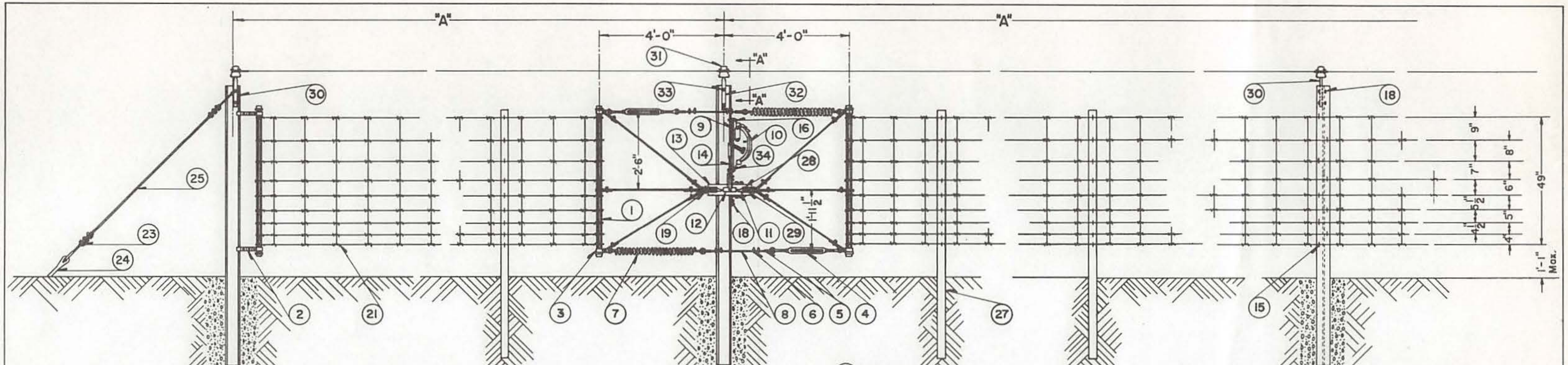
Transformers shall conform to current AAR Specifications 83-

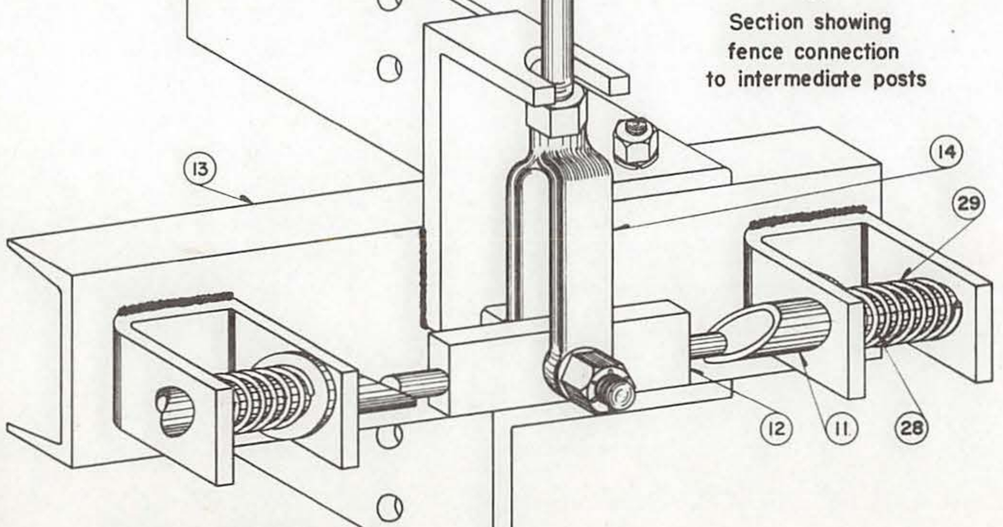
The coils shall be thoroughly impregnated by the vacuum and pressure process to remove all moisture and secure complete penetration of the windings by the impregnating material.

Adjustable Resistors shall be 5.6 onms G.R.S. No. 46450 Gr. 9.

BALTIMORE & OHIO RAILROAD
RECTIFIER & LIGHTING TRANSFORMERS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Feb. 25, 1951

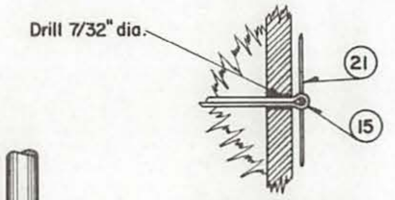
Adopted: 5-15-51.


"A"
"A"
4'-0"
4'-0"
"A"
"A"
2'-6"
1'-1½"
9"
8"
7"
6"
5½"
5"
4½"
4"
49"
1'-1" Max.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
18
19
21
23
24
25
27
28
29
30
31
32
33
34

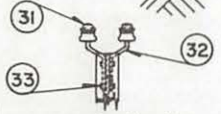

13
14
29
12
11
28

SKETCH SHOWING TRIGGER ARRANGEMENT

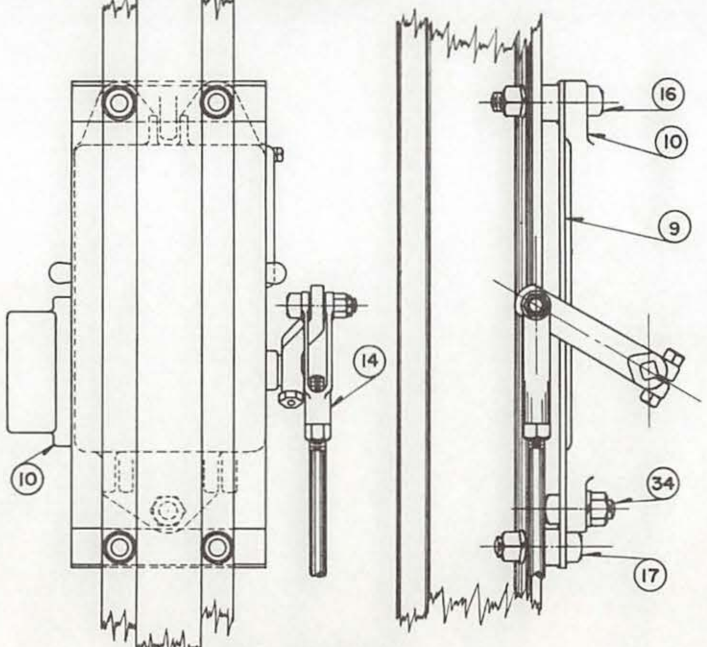
No Scale


Drill 7/32" dia.
21
15

Section showing fence connection to intermediate posts



Section "A-A"


16
10
9
14
10
34
17

VIEW SHOWING CIRCUIT CONTROLLER CONNECTION

Notes:

Distance "A" to depend on local conditions but not to exceed 225 feet.

Fencing to be securely fastened on Anchor Posts and to be loosely connected to Intermediate Posts.

Posts may be short lengths of rail.

Paint all posts aluminum.

Movable parts and Trigger Assembly to be kept well lubricated.

Anchor and Controller Posts to be rigid. Set in concrete if necessary.

Distance between posts shall be 15'-0" min. where ground conditions permit.

Approved: A L Jordan
Signal Engineer

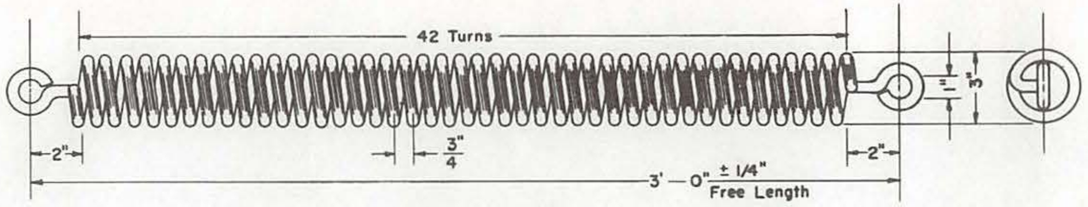
BALTIMORE & OHIO RAILROAD
SAFETY FENCE
SINGLE TIER
Office of Signal Engineer
Baltimore, Md.
Feb. 1, 1962

W.J.G.

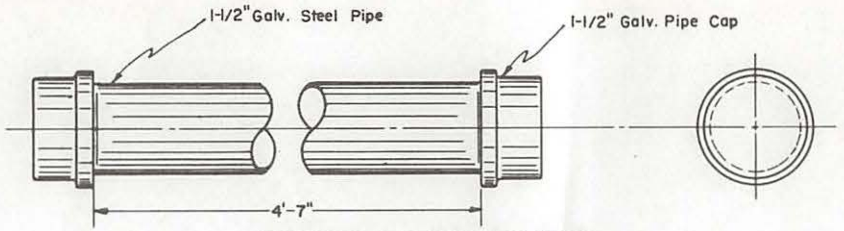
Sheet No. 1

S-100-E

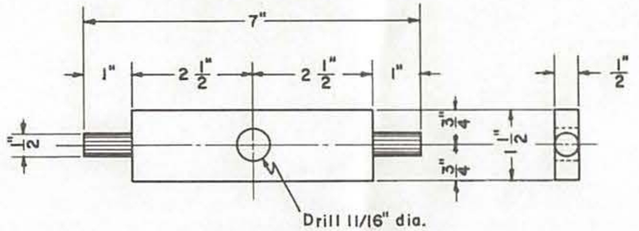
Adopted-8-6-59.
Revised-2-1-62 account operating pipe made spring loaded.


42 Turns
1"
3"
2"
3/4"
2"
3'-0" ± 1/4"
Free Length

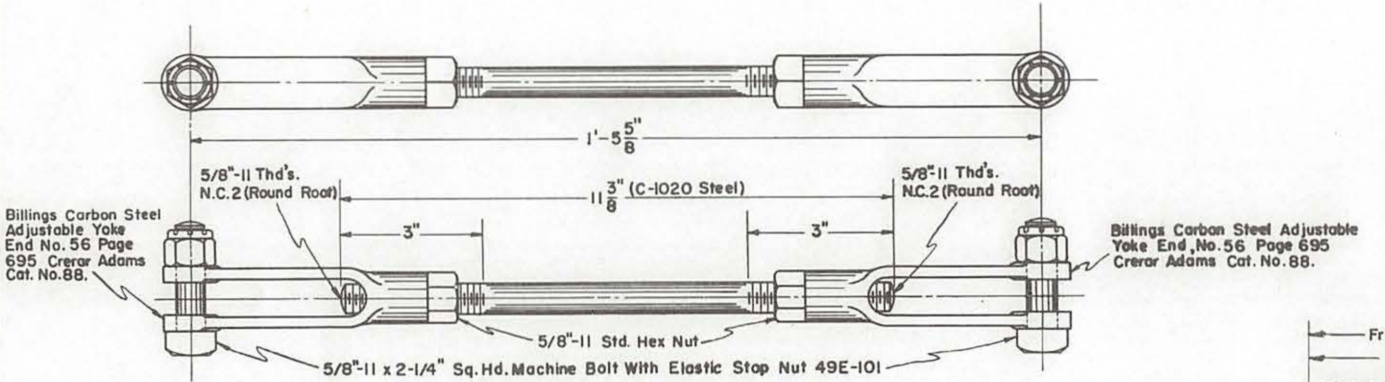
MAIN SPRING - 1001
Material: 1/2" dia. Spring Steel
(Union Spring & Mfg. Co.
2001 Clark Bldg.-Pittsburgh, Pa.)


1-1/2" Galv. Steel Pipe
1-1/2" Galv. Pipe Cap
4'-7"

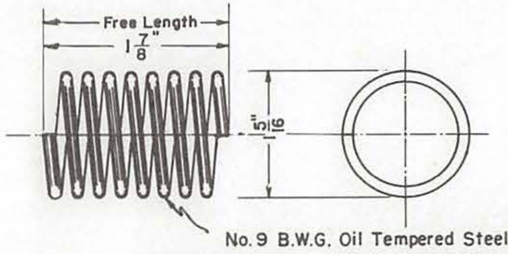
SPREADER PIPE ASSEMBLY - 1009
Galv. Steel Pipe


7"
1"
2 1/2"
2 1/2"
1"
1/2"
1/2"
3/4"
3/4"
1 1/2"
1/2"
Drill 11/16" dia.

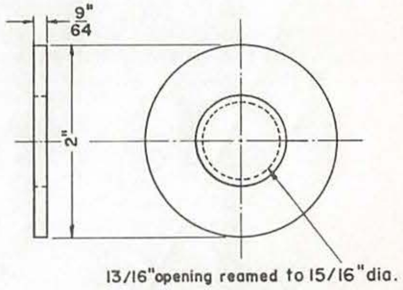
TRIGGER - 1002
Material: Cold Rolled Steel


1'-5 5/8"
5/8"-11 Thd's.
N.C.2 (Round Root)
11 3/8" (C-1020 Steel)
5/8"-11 Thd's.
N.C.2 (Round Root)
Billings Carbon Steel Adjustable Yoke End No. 56 Page 695 Crerar Adams Cat. No. 88.
3"
3"
Billings Carbon Steel Adjustable Yoke End, No. 56 Page 695 Crerar Adams Cat. No. 88.
5/8"-11 Std. Hex Nut
5/8"-11 x 2-1/4" Sq. Hd. Machine Bolt With Elastic Stop Nut 49E-101

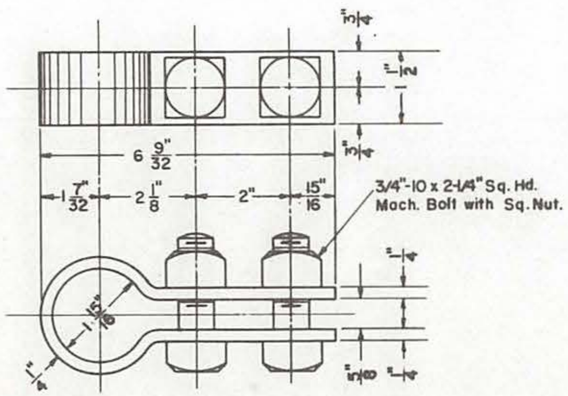
CONNECTING ROD ASSEMBLY - 1008


Free Length
1 7/8"
1 5/16"
No. 9 B.W.G. Oil Tempered Steel Wire
(No. 2 Compression Spring, Pg. 722,
Crerar Adams Cat. 88.)

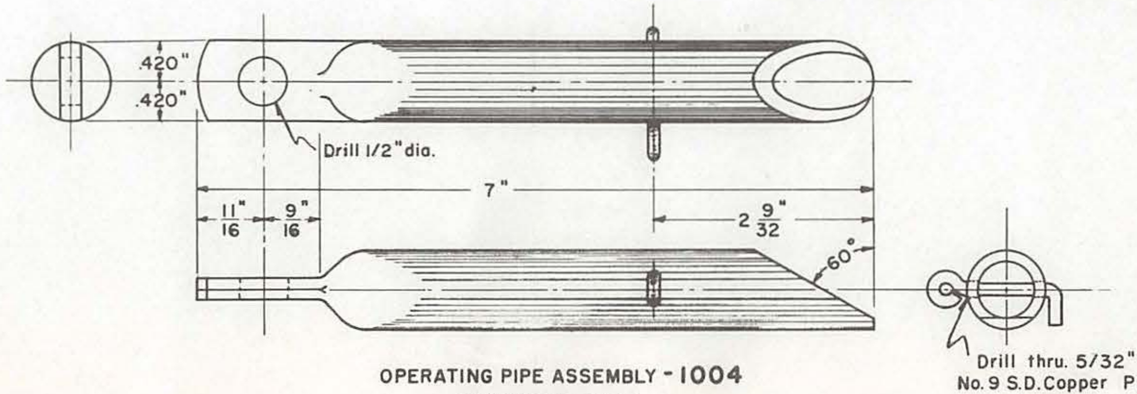
SPRING - 10015


9/64"
2"
13/16" opening reamed to 15/16" dia.

WASHER - 10014
Material: 3/4" Standard Flat Washer


1/4"
1/2"
1/4"
6 9/32"
1 7/32"
2 1/8"
2"
15/16"
3/4"-10 x 2-1/4" Sq. Hd.
Mach. Bolt with Sq. Nut.
1 15/16"
1/4"
1/4"
5/8"
1/4"

SPREADER CLAMP - 10013
Material: C-1020 Steel


.420"
.420"
Drill 1/2" dia.
7"
11/16"
9/16"
2 9/32"
60°
Drill thru. 5/32" dia. for
No. 9 S.D. Copper Pin 2-1/8" Lg.

OPERATING PIPE ASSEMBLY - 1004
1/2" Galvanized Pipe

Approved A. L. Jordan
Signal Engineer

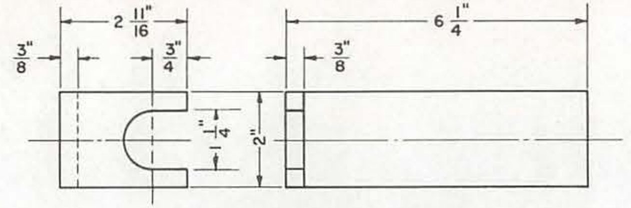
BALTIMORE & OHIO RAILROAD
SAFETY FENCE
SINGLE TIER
Office of Signal Engineer
Baltimore, Md.
Oct. 10, 1961

Adopted: 8-6-59.

W.J.G.

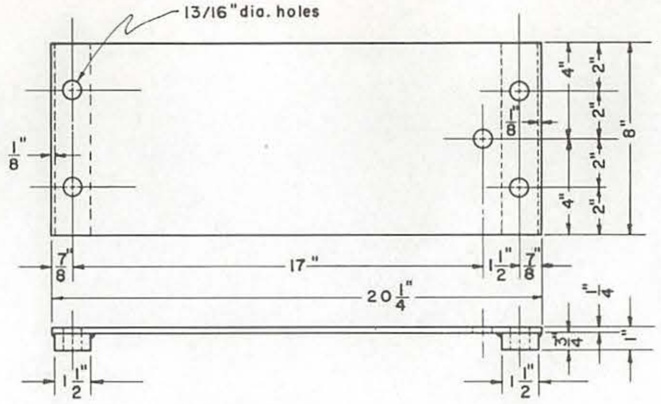
Sheet No. 2

S-100-E



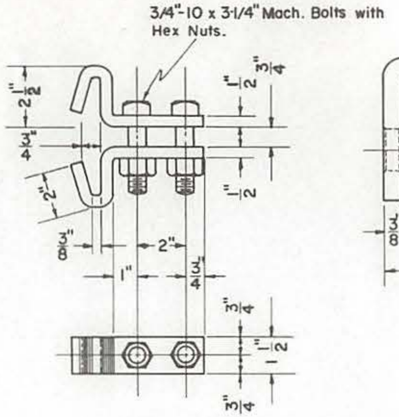
2 11/16"
3/8"
3/4"
6 1/4"
3/8"
1 1/4"
2"

CONNECTING ROD GUIDE-10010
C-1020 Steel



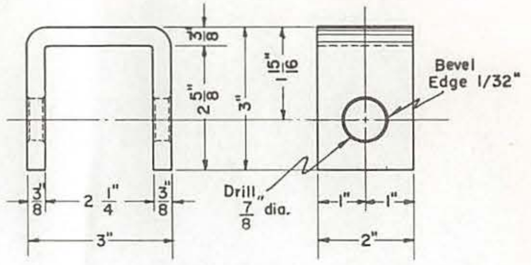
13/16" dia. holes
4"
2"
2"
2"
4"
2"
8"
1/8"
8 1/8"
7/8"
17"
1 1/2"
7/8"
20 1/4"
1/4"
3/4"
1"
1 1/2"
1 1/2"

CONTROLLER BASE PLATE-10011
C-1020 Steel



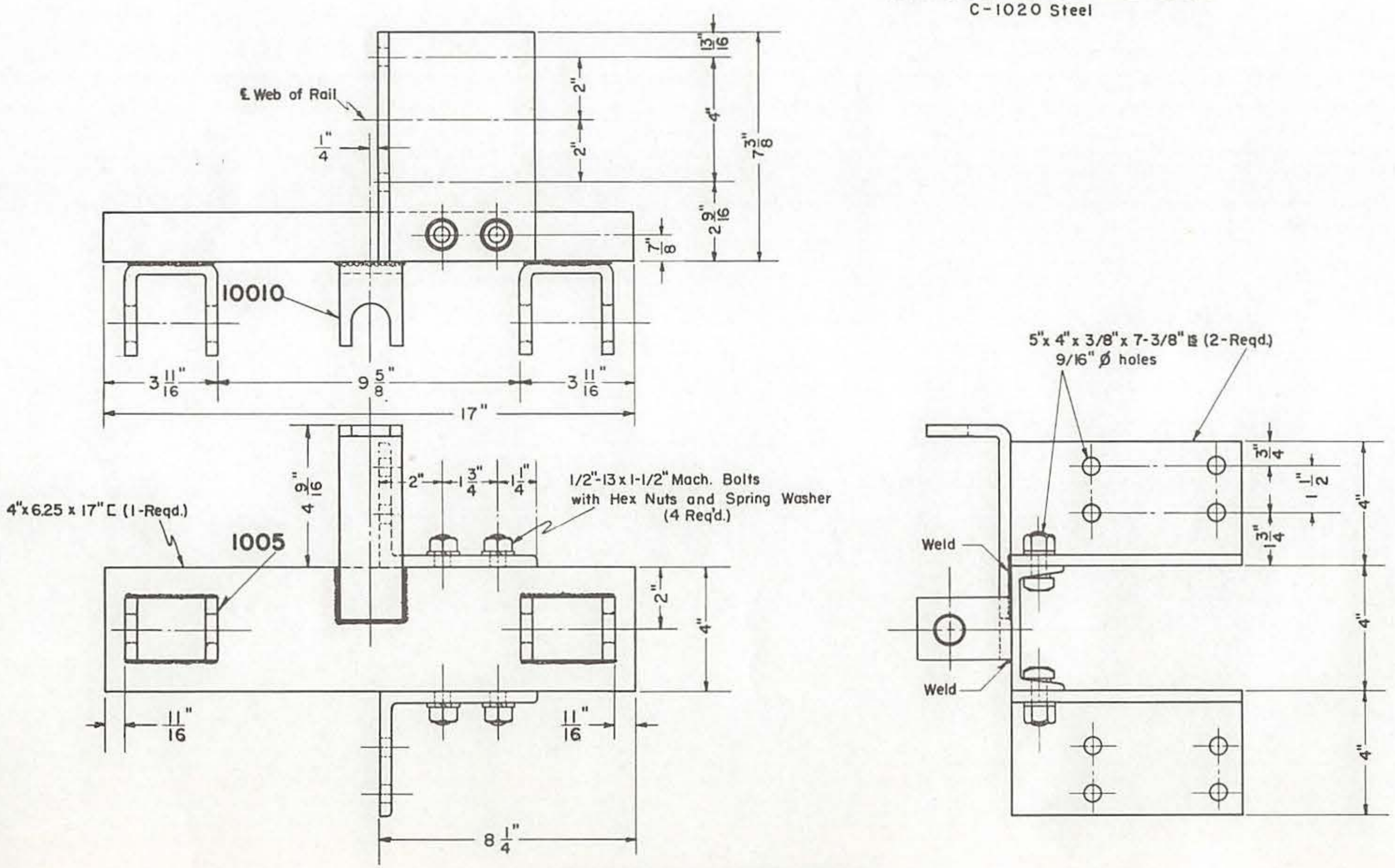
3/4"-10 x 3-1/4" Mach. Bolts with Hex Nuts.
2 1/2"
4 1/4"
2"
3/8"
1"
2"
3/4"
1/2"
3/4"
1/2"
3/4"
1 1/2"
3/4"

RAIL BASE CLAMP-10012
C-1020 Steel



3/8"
2 5/8"
3"
1 5/16"
Bevel Edge 1/32"
Drill 7/8" dia.
3/8"
2 1/4"
3/8"
3"
1"
1"
2"

GUIDE-1005
C-1020 Steel



℄ Web of Rail
1/4"
13/16"
2"
2"
4"
7 3/8"
2 9/16"
7/8"
10010
3 11/16"
9 5/8"
3 11/16"
17"
4"x6.25 x 17" ⊏ (1-Reqd.)
1005
4 9/16"
2"
1 3/4"
1 1/4"
1/2"-13x1-1/2" Mach. Bolts with Hex Nuts and Spring Washer (4 Req'd.)
2"
4"
11/16"
11/16"
8 1/4"
5"x 4"x 3/8"x 7-3/8" ∟s (2-Reqd.)
9/16" Ø holes
Weld
Weld
3/4"
1 1/2"
3/4"
4"
4"
4"

TRIGGER GUARD ASSEMBLY-1003

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

SAFETY FENCE
SINGLE TIER

Office of Signal Engineer
Baltimore, Md.
Oct.10,1961

W.J.G.

Adopted: 8-6-59.

Sheet No. 3

S-100-E

MATERIAL LIST FOR 1 TIER SAFETY FENCE

Item	Number	Req'd.	Name	Mf'g.	Ref.	Plan No.
1	1009	4	Spreader Pipe Assembly	Cumb.		S-100-E, sh. 2
2	10012	4	Rail Base Clamp	Cumb.		S-100-E, sh. 3
3	10013	8	Spreader Clamp	Cumb.		S-100-E, sh. 2
4		2	Standard Galv. Turnbuckle, Eye to Eye, 5/8" dia. x 12" take up		L.A.Benson	Cat.E, Pg. 687
5		14	Galv. Wire Rope Thimbles for 1/4" dia. rope		L.A.Benson	Cat.E, Pg. 525
6		20	1/4" Wire Rope Clips		L.A.Benson	Cat.E, Pg. 525
7	1001	2	Main Spring (Union Spring & Mfg. Co.-2001 Clark Bldg., Pittsburgh, Pa.)			S-100-E, sh. 2
8		35ft.	Plow Steel Hoisting Rope 1/4" dia.- 6 Str.-37 Wires to the str.		L.A.Benson	Cat. E, Pg. 526
9	10011	1	Controller Base Plate	Cumb.		S-100-E, sh. 3
10		1	Model 7 Switch Circuit Controller, 4-way-2 pos. complete	Cumb.		
11	1004	2	Operating Pipe Assembly	Cumb.		S-100-E, sh. 2
12	1002	1	Trigger	Cumb.		S-100-E, sh. 2
13	1003	1	Trigger Guard Assembly	Cumb.		S-100-E, sh. 3
14	1008	1	Connecting Rod Assembly	Cumb.		S-100-E, sh. 2
15		As Required	3/16 x 2" Cotter Pins			
16		2	3/4"-10 x 4" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
17		2	3/4"-10 x 3" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
18		8	1/2"-13 x 2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
19		2	3/8" Laughlin Anchor Shackles No. 213		Crerar, Adams	Cat. 88, Pg. 471
20						
21		As Required	4'-1" Wide Standard Woven Wire Fence			
22						
23	T&T1753	4	Three Bolt Guy Clamp			S-504
24		2	Guy Rod			
25		2	3/8" Messenger Strand 12'-0" lg.			
26						
27		As Required	Steel Fence Posts			
28	10014	2	Washer	Cumb.		S-100-E, sh. 2
29	10015	2	Spring	Cumb.		S-100-E, sh. 2
30		As Required	Pressed Steel Pole Top Pin, Straight Base No. SA28X8	Line Mat. Co.	Line Mat. Co.	Sec. DL2, Pg. 14
31		As Required	Glass Insulator, AAR (CS) 1999			
32		As Required	Offset Pole Top Pin, No. 12205	Line Mat. Co.	Line Mat. Co.	Sec. DL2, Pg. 15
33		As Required	1/2"-13 x 2-1/2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
34		1	3/4"-10 x 2-1/4" Sq. Hd. Machine Bolt with Hex Nut & Spring Washer			
35						
36						

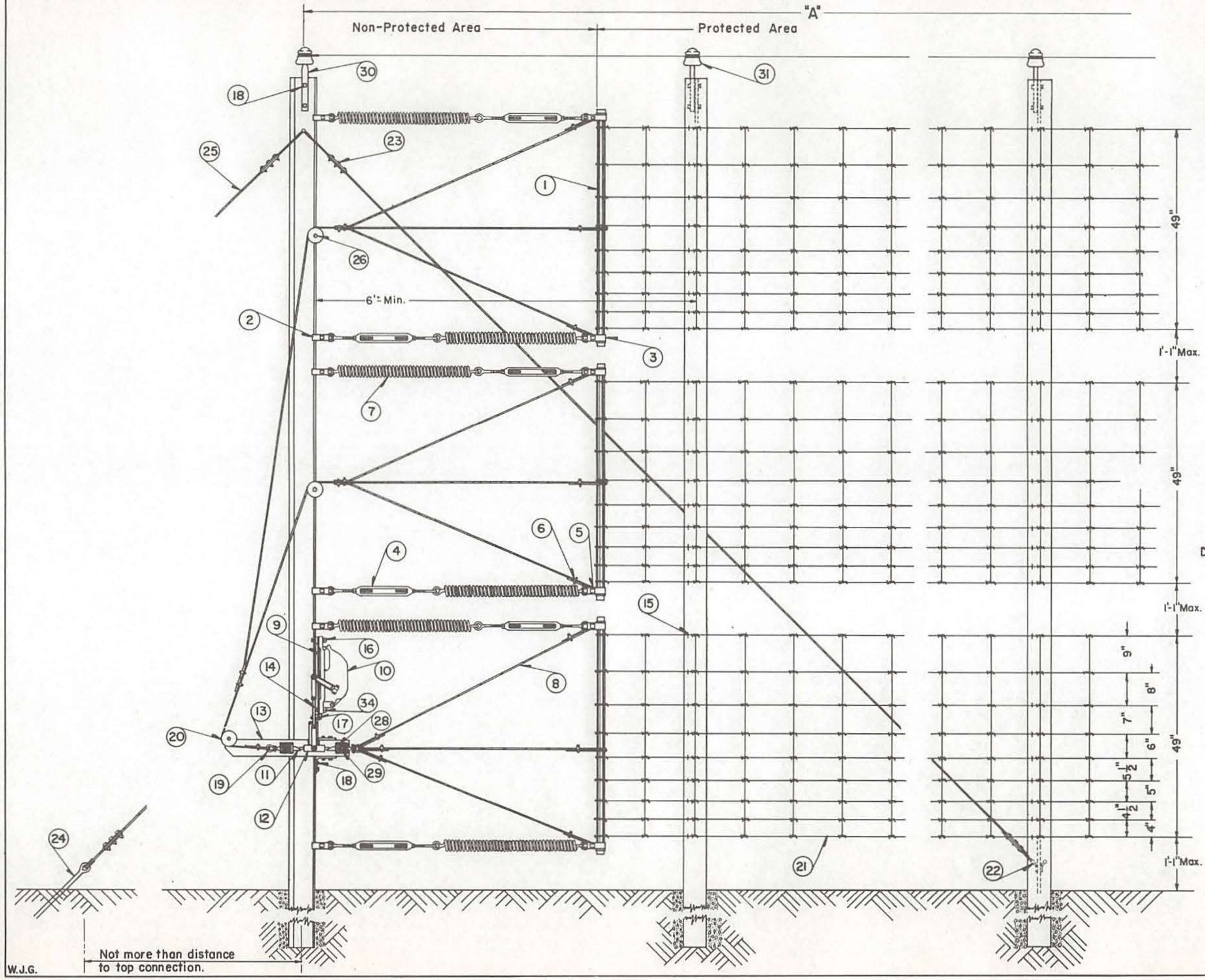
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SAFETY FENCE
SINGLE TIER
Office of Signal Engineer
Baltimore, Md.
Oct. 10, 1961

Adopted 8-6-59

RAK

Sheet No. 4 S-100-E


"A"
Non-Protected Area
Protected Area
6'- Min.
49"
1'-1" Max.
49"
1'-1" Max.
9"
8"
7"
6"
$5\frac{1}{2}$"
5"
$4\frac{1}{2}$"
4"
49"
1'-1" Max.
30
31
18
25
23
1
26
2
3
7
6
5
4
15
9
16
10
14
8
34
13
17
28
20
19
11
18
29
12
24
21
22
Not more than distance
to top connection

Notes:

Distance "A" to depend on local conditions but not to exceed 225 feet.

Fencing to be securely fastened on Anchor Posts and to be loosely connected to Intermediate Posts.

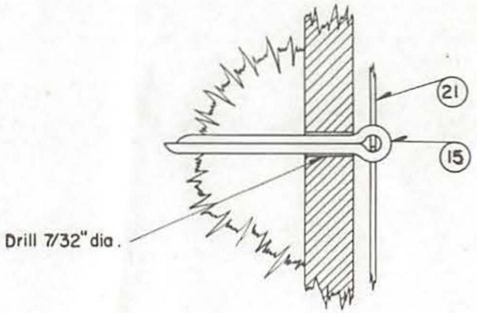
Posts shall be used rail.

Paint all posts aluminum.

Movable parts and Trigger Assembly to be kept well lubricated.

Anchor and Controller Posts to be rigid. Set in concrete if necessary.

Distance between posts shall be 15'-0" min. where ground conditions permit.


21
15
Drill 7/32" dia.

Section showing fence connection to intermediate posts.

Approved: A L Jordan
Signal Engineer

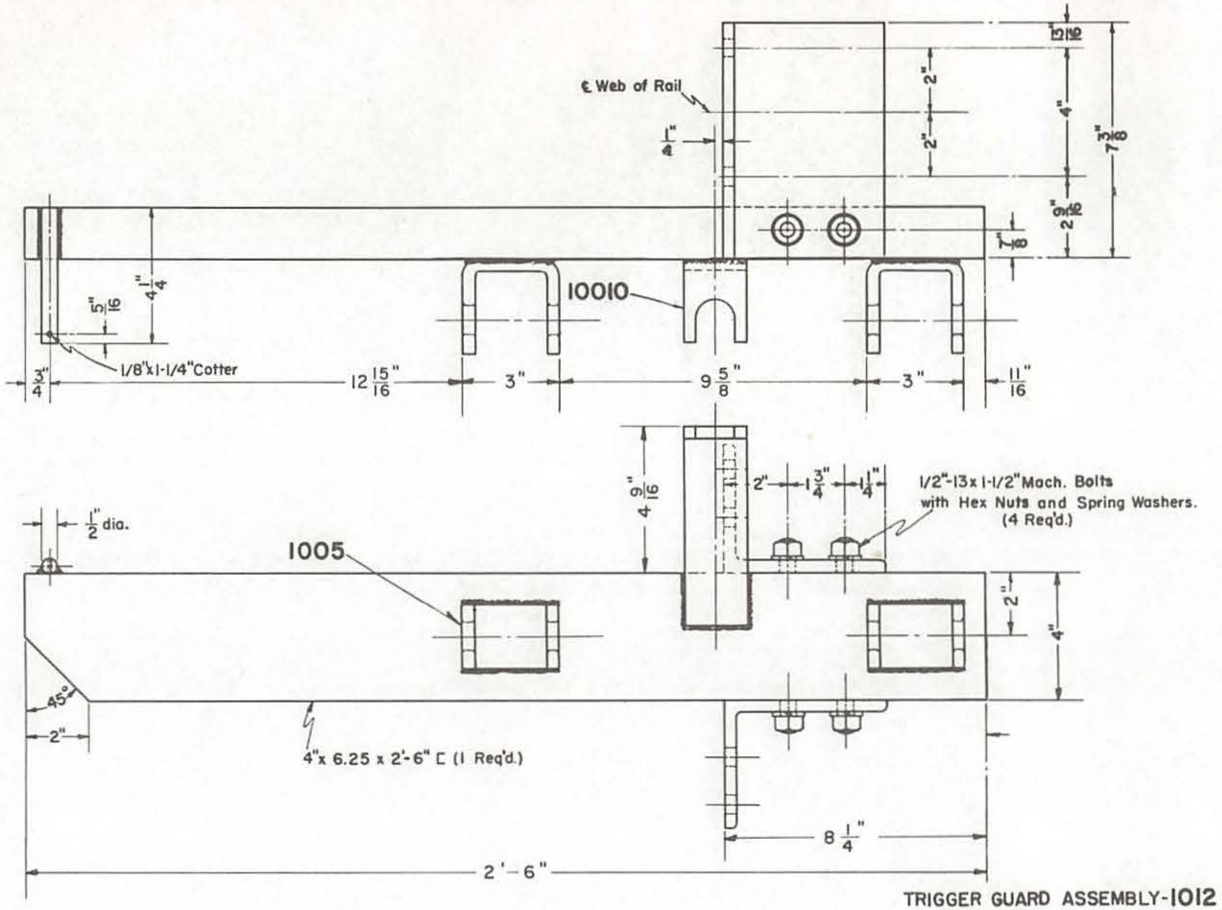
BALTIMORE & OHIO RAILROAD
SAFETY FENCE
(MULTIPLE TIER - END OPERATED)
Office of Signal Engineer
Baltimore, Md.
Feb. 1, 1962

Adopted - 8-6-59
Revised - 2-1-62 account operating pipe made spring loaded.

W.J.G.

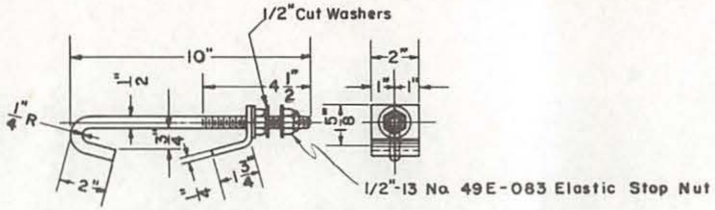
Sheet No. 1

S-101-C



℄ Web of Rail
10010
1005
1/8"x1-1/4" Cotter
12 15/16"
3"
9 5/8"
3"
11/16"
3/4"
5/16"
4 1/4"
7/8"
2 9/16"
7 3/8"
4"
2"
2"
13/16"
1/2" dia.
4 9/16"
2"
1 3/4"
1 1/4"
1/2"-13 x 1-1/2" Mach. Bolts with Hex Nuts and Spring Washers. (4 Req'd.)
45°
2"
4"x 6.25 x 2'-6" ⊏ (1 Req'd.)
8 1/4"
2'-6"

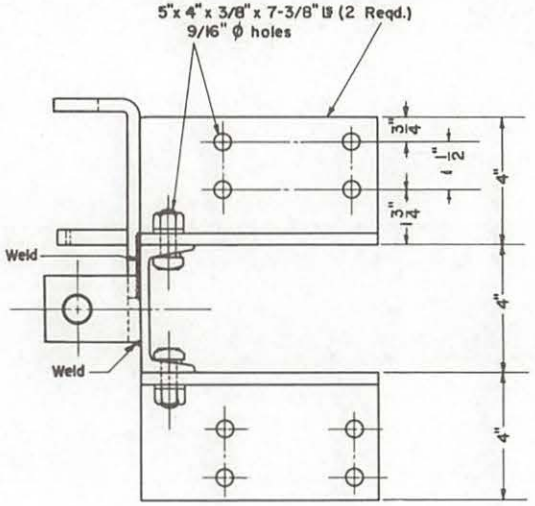
TRIGGER GUARD ASSEMBLY-1012



1/2" Cut Washers
10"
4 1/2"
2"
1"
1"
1/2"
5/8"
3/4"
1 3/4"
1/4"
2"
R
1/2"-13 No. 49E-083 Elastic Stop Nut

SHEAVE SHAFT-1011

C-1020 Steel



5"x 4" x 3/8" x 7-3/8" ∟ (2 Reqd.)
9/16" ϕ holes
Weld
Weld
3/4"
1 1/2"
1 3/4"
4"
4"
4"

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

SAFETY FENCE

(MULTIPLE TIER-END OPERATED)

Office of Signal Engineer
Baltimore, Md.
Oct. 12, 1961

Adopted: 8-6-59

W.J.G.

Sheet No. 2

S-101-C

MATERIAL LIST FOR 2 TIER SAFETY FENCE

Item	Number	Req'd.	Name	Mf'g.	Ref.	Plan No.
1	1009	4	Spreader Pipe Assembly	Cumb.		S-100-E, sh.2
2	10012	8	Rail Base Clamp	Cumb.		S-100-E, sh.3
3	10013	8	Spreader Clamp	Cumb.		S-100-E, sh.2
4		4	Standard Galv. Turnbuckle, Eye to Eye, 5/8" dia. x 12" take up		L.A.Benson	Cat.E, Pg.687
5		8	Galv. Wire Rope Thimbles for 1/4" dia. rope		L.A.Benson	Cat.E, Pg.525
6		12	1/4" Wire Rope Clips		L.A.Benson	Cat.E, Pg.525
7	1001	4	Main Spring (Union Spring & Mfg. Co.-2001 Clark Bldg., Pittsburgh, Pa.)			S-100-E, sh.2
8		52ft.	Plow Steel Hoisting Rope 1/4" dia.-6 Str.-37 Wires to the str.		L.A.Benson	Cat. E, Pg.526
9	10011	1	Controller Base Plate	Cumb.		S-100-E, sh.3
10		1	Model 7 Switch Circuit Controller, 4-way-2 pos. complete	Cumb.		
11	1004	2	Operating Pipe Assembly	Cumb.		S-100-E, sh.2
12	1002	1	Trigger	Cumb.		S-100-E, sh.2
13	1012	1	Trigger Guard Assembly	Cumb.		S-101 -C, sh.2
14	1008	1	Connecting Rod Assembly	Cumb.		S-100-E, sh.2
15		As Required	3/16 x 2" Cotter Pins			
16		2	3/4"-10x4" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
17		2	3/4"-10x3" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
18		8	1/2"-13x2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
19		2	3/8" Laughlin Anchor Shackles No. 213		Crerar, Adams	Cat.88, Pg.471
20		2	Regular Wire Rope Sheaves for 1/4" dia. rope (No.1173-4" dia. x 1/2" shaft)		Crerar, Adams	Cat.88, Pg.459
21		As Required	4'-1" Wide Standard Woven Wire Fence			
22		As Required	3/4" Galv. Bolt Hubeyes No.1101	Hubbard	Graybar	Cat.104, Pg.759
23	T&T1753	As Required	Three Bolt Guy Clamp			S-504
24		2	Guy Rod			
25		As Required	3/8" Messenger Strand			
26	1011	1	Sheave Shaft			S-101-C, sh.2
27						
28	10014	2	Washer	Cumb.		S-100-E, sh.2
29	10015	2	Spring	Cumb.		S-100-E, sh.2
30		As Required	Pressed Steel Pole Top Pin, Straight Base No.SA28X8	Line Mat.Co.	Line Mat.Co.	Sec.DL2, Pg.14
31		As Required	Glass Insulator, AAR (CS) 1999			
32		As Required	Offset Pole Top Pin, No.12205	Line Mat.Co.	Line Mat.Co.	Sec.DL2, Pg.15
33		As Required	1/2"-13X2-1/2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
34		1	3/4"-10x2-1/4" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
35						
36						

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SAFETY FENCE
(MULTIPLE TIER - END OPERATED)
Office of Signal Engineer
Baltimore, Md.
Oct. 12, 1961

Adopted: 8-6-59

RMK

Sheet No. 3

S-101-C

MATERIAL LIST FOR 3 TIER SAFETY FENCE

Item	Number	Req'd.	Name	Mf'g.	Ref.	Plan No.
1	1009	6	Spreader Pipe Assembly	Cumb.		S-100-E, sh.2
2	10012	12	Rail Base Clamp	Cumb.		S-100-E, sh.3
3	10013	12	Spreader Clamp	Cumb.		S-100-E, sh.2
4		6	Standard Galv. Turnbuckle, Eye to Eye, 5/8" dia. x 12" take up		L.A.Benson	Cat.E, Pg.687
5		10	Galv. Wire Rope Thimbles for 1/4" dia. rope		L.A.Benson	Cat.E, Pg.525
6		19	1/4" Wire Rope Clips		L.A.Benson	Cat.E, Pg.525
7	1001	6	Main Spring (Union Spring & Mfg. Co.-2001 Clark Bldg., Pittsburgh, Pa.)			S-100-E, sh.2
8		85ft.	Plow Steel Hoisting Rope 1/4" dia.- 6 Str.-37 Wires to the str.		L.A.Benson	Cat. E, Pg.526
9	10011	1	Controller Base Plate	Cumb.		S-100-E, sh.3
10		1	Model 7 Switch Circuit Controller, 4-way-2 pos. complete	Cumb.		
11	1004	2	Operating Pipe Assembly	Cumb.		S-100-E, sh.2
12	1002	1	Trigger	Cumb.		S-100-E, sh.2
13	1012	1	Trigger Guard Assembly	Cumb.		S-101-C, sh.2
14	1008	1	Connecting Rod Assembly	Cumb.		S-100-E, sh.2
15		As Required	3/16 x 2" Cotter Pins			
16		2	3/4" 10 x 4" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
17		2	3/4" 10 x 3" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
18			1/2" 13 x 2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
19		2	3/8" Laughlin Anchor Shackles No. 213		Crerar, Adams	Cat.88, Pg.471
20		3	Regular Wire Rope Sheaves for 1/4" dia. rope (No.1173-4" dia. x 1/2" shaft)		Crerar, Adams	Cat 88, Pg.459
21		As Required	4'-1" Wide Standard Woven Wire Fence			
22		As Required	3/4" Galv. Bolt Hubeyes No. 1101	Hubbard	Graybar	Cat. 104, Pg.759
23	T&T1753	As Required	Three Bolt Guy Clamp			S-504
24		2	Guy Rod			
25		As Required	3/8" Messenger Strand			
26	1011	2	Sheave Shaft			S-101-C, sh.2
27						
28	10014	2	Washer	Cumb.		S-100-E, sh.2
29	10015	2	Spring	Cumb.		S-100-E, sh.2
30		As Required	Pressed Steel Pole Top Pin, Straight Base No.SA28X8	Line Mat. Co.	Line Mat. Co.	Sec. DL2, Pg.14
31		As Required	Glass Insulator, AAR (CS) 1999			
32		As Required	Offset Pole Top Pin, No. 12205	Line Mat. Co.	Line Mat. Co.	Sec. DL 2, Pg.15
33		As Required	1/2"-13 X 2-1/2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer			
34		1	3/4"-10 x 2-1/4" Sq. Hd. Machine Bolt with Hex Nut & Spring Washer			
35						
36						

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SAFETY FENCE
(MULTIPLE TIER END OPERATED)
Office of Signal Engineer
Baltimore, Md.
Oct. 12, 1961

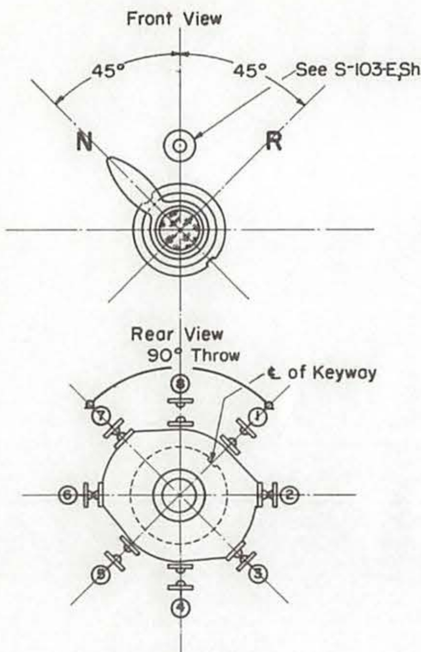
Adopted: 8-6-59

RK

Sheet No. 4

S-101-C

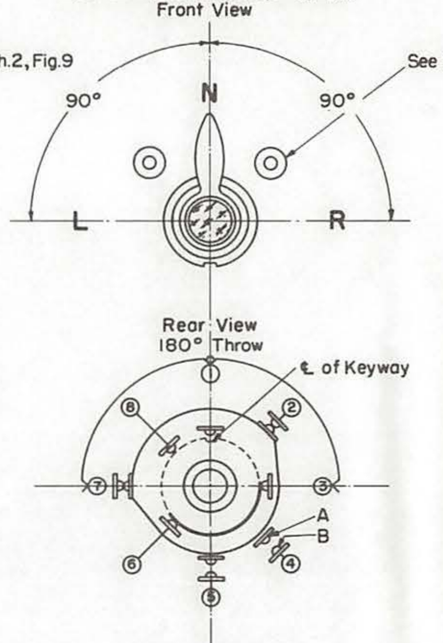
SWITCH LEVER COMPLETE G.R.S.CO. NO.55330-12,GR.15.
2-Position,90°R.H.Movement
(For drilling see S-103-E,Sh.2,Fig.7).


Front View
45°
45°
See S-103-E,Sh.2,Fig.9
N
R
Rear View
90° Throw
℄ of Keyway
8
7
1
6
2
5
3
4

Circuit Selections

2A	NC	2B
3A	N	3B
6A	NC	6B
7A	N	7B
1A	RC	1B
4A	R	4B
5A	RC	5B
8A	R	8B

SIGNAL LEVER COMPLETE G.R.S.CO.NO.55330-12,GR.16.
3-Position,90° R.& L.H.Movement
(For drilling see S-103-E,Sh.2,Fig5).

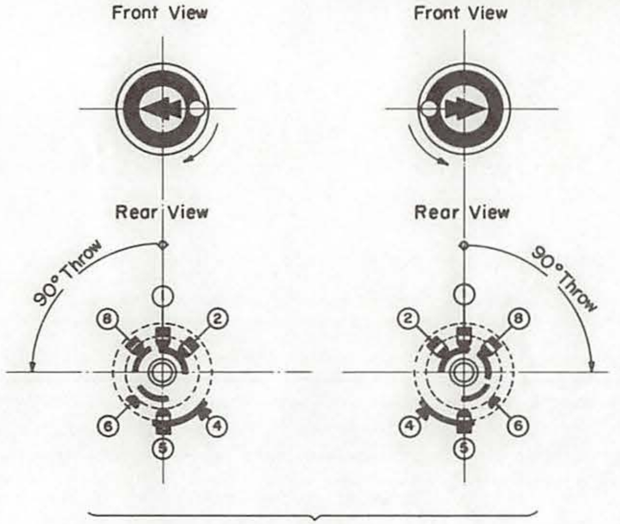

Front View
90°
90°
N
L
R
See S-103-E,Sh.2,Fig.10.
Rear View
180° Throw
℄ of Keyway
1
8
2
7
3
A
B
6
5
4

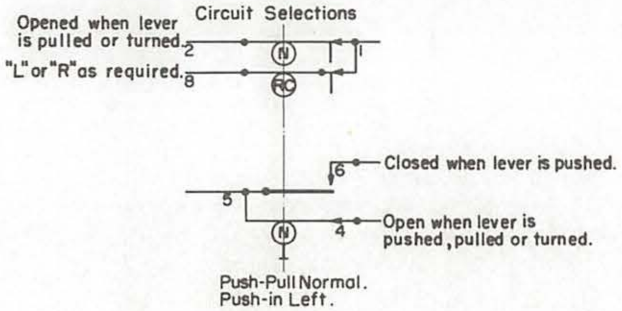
Circuit Selections

8	L	6
3	N	
	R	1
2A	NL	2B
7A	NR	7B
4A	L	4B
5A	R	5B

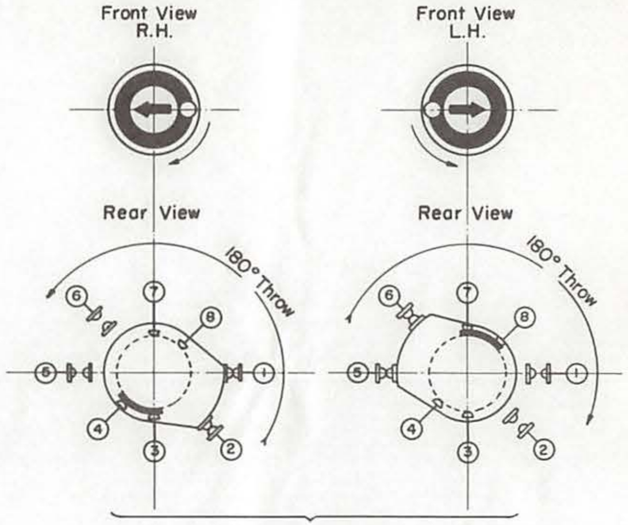
SIGNAL LEVER COMPLETE G.R.S.CO.NO.55330-3,GR.18.
2-Position,90° R.H. Movement
(For drilling see S-103-E,Sh.2,Fig.5).

SIGNAL LEVER COMPLETE G.R.S.CO.NO.55330-3,GR.19.
2-Position,90°L.H. Movement
(For drilling see S-103-E,Sh.2,Fig.5).


Front View
Front View
Rear View
Rear View
90° Throw
90° Throw
1
8
2
6
4
5


Circuit Selections
Opened when lever is pulled or turned.
"L" or "R" as required.
2
8
N
RC
1
6
Closed when lever is pushed.
5
N
4
Open when lever is pushed, pulled or turned.
Push-Pull Normal.
Push-in Left.

TRAFFIC LEVER COMPLETE G.R.S.CO.NO.55330-12,GR.18.
2-Position,180°R.H. and L.H. Movement
(For drilling see S-103-E,Sh.2,Fig.8).


Front View
R.H.
Front View
L.H.
Rear View
Rear View
180° Throw
180° Throw
7
6
8
5
1
4
3
2

Circuit Selections

1A	LX	1B
2A	L	2B
5A	R	5B
6A	RY	6B
3	L	4
7	R	8

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
ROTARY LEVERS FOR CTC TYPE CONTROL MACHINE
Office of Signal Engineer
Baltimore, Md.
Feb. 1, 1962

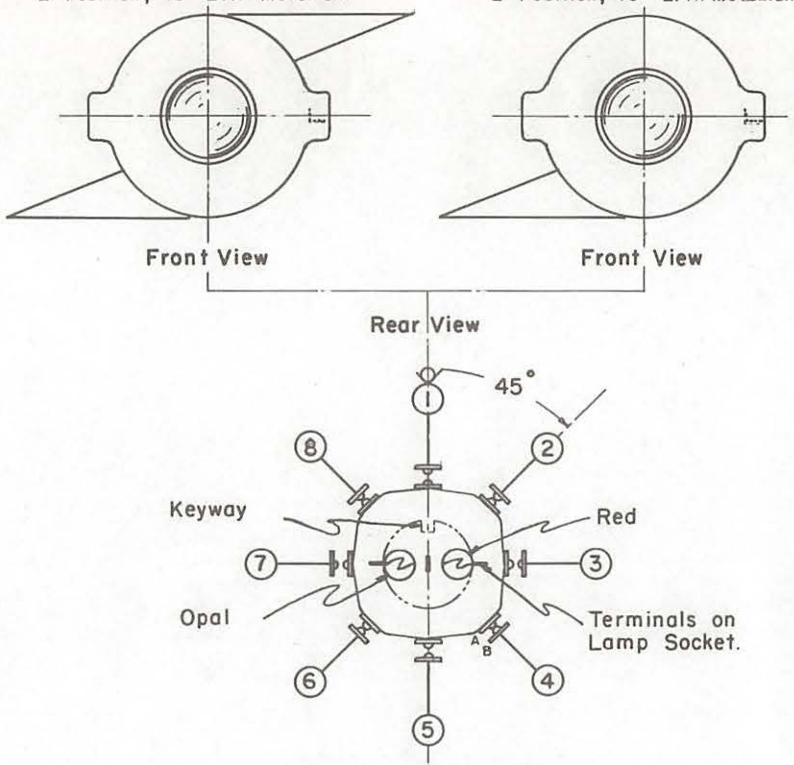
Sheet No.1

S-102-F

1-16-52: Made & Corrected.
Adopted: 11-18-52.
2-1-62: Signal lever's G.R.S. Co. No. 55330-3 Gr.18 & 19 revised.

ROTARY SWITCH
WITH SWITCH POINT INDICATOR
FOR LEFT HAND CROSSOVER
G.R.S.Co. No. 55330-22, GR.1
2-Position, 45° L.H. Movement

ROTARY SWITCH
WITH SWITCH POINT INDICATOR
FOR LEFT HAND TURN-OUT
G.R.S.Co. No. 55330-22, GR.3
2-Position, 45° L.H. Movement

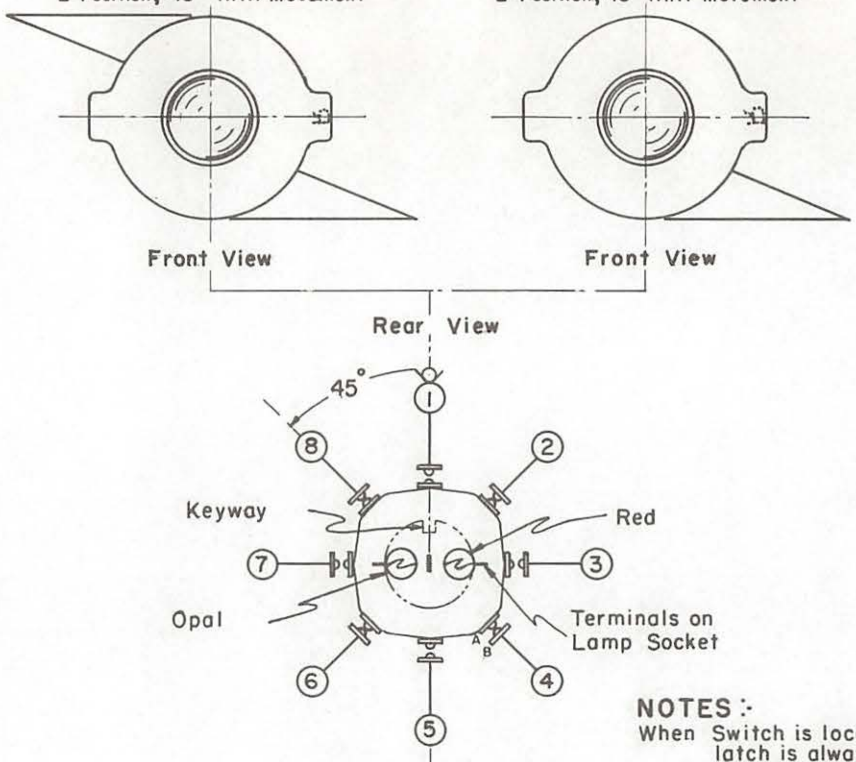

Front View
Front View
Rear View
45°
1
2
3
4
5
6
7
8
Keyway
Red
Opal
Terminals on Lamp Socket.
A
B

CIRCUIT SELECTIONS

1A	Ⓡ	1B
2A	Ⓝ	2B
3A	Ⓡ	3B
4A	Ⓝ	4B
5A	Ⓡ	5B
6A	Ⓝ	6B
7A	Ⓡ	7B
8A	Ⓝ	8B

ROTARY SWITCH
WITH SWITCH POINT INDICATOR
FOR RIGHT HAND CROSSOVER
G.R.S.Co. No. 55330-22, GR.2
2-Position, 45° R.H. Movement

ROTARY SWITCH
WITH SWITCH POINT INDICATOR
FOR RIGHT HAND TURN-OUT
G.R.S.Co. No. 55330-22, GR.4
2-Position, 45° R.H. Movement


Front View
Front View
Rear View
45°
1
2
3
4
5
6
7
8
Keyway
Red
Opal
Terminals on Lamp Socket
A
B

CIRCUIT SELECTIONS

1A	Ⓡ	1B
2A	Ⓝ	2B
3A	Ⓡ	3B
4A	Ⓝ	4B
5A	Ⓡ	5B
6A	Ⓝ	6B
7A	Ⓡ	7B
8A	Ⓝ	8B

NOTES :-

When Switch is located on track as on C.T.C. interlocking ball latch is always at right angles to track.
If track runs horizontal or at right angle ball latch is always on upper side of track.
If track runs vertical ball latch is at left hand side of track.

When Switch is mounted on Control Machine Panel end play must not exceed .025".

Assemble knob parallel to track with letter "L" or "R" on R.H. side for crossovers (⟋ or ⟍) or turn-outs (⟋ or ⟍).

Assemble knob parallel to track with letter "L" or "R" on L.H. side for turn-outs (⟋ or ⟍).

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

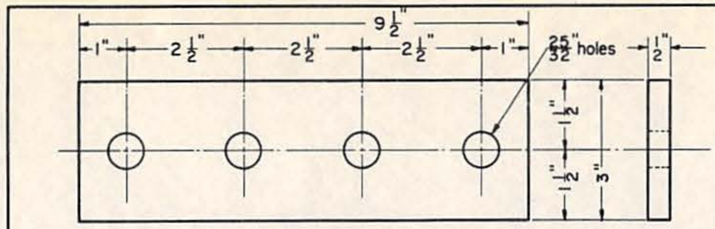
ROTARY LEVERS
FOR CTC TYPE CONTROL MACHINE

Office of Signal Engineer
Baltimore, Md.
Feb. 1, 1962

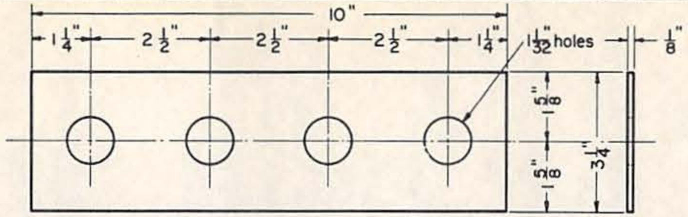
Feb. 1, 1962 - Sh. 2 added

Sheet No. 2

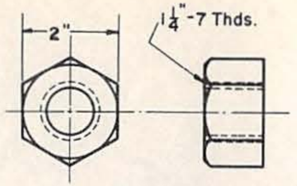
S-102-F


9 1/2"
1"
2 1/2"
2 1/2"
2 1/2"
1"
25/32" holes
1/2"
1 1/2"
1 1/2"
3"

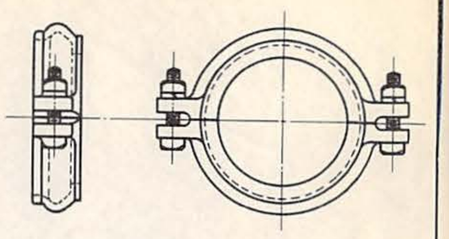
SPLICE PLATE (C-1020Steel)-1041


10"
1 1/4"
2 1/2"
2 1/2"
2 1/2"
1 1/4"
1 1/32" holes
1/8"
1 5/8"
1 5/8"
3 1/4"

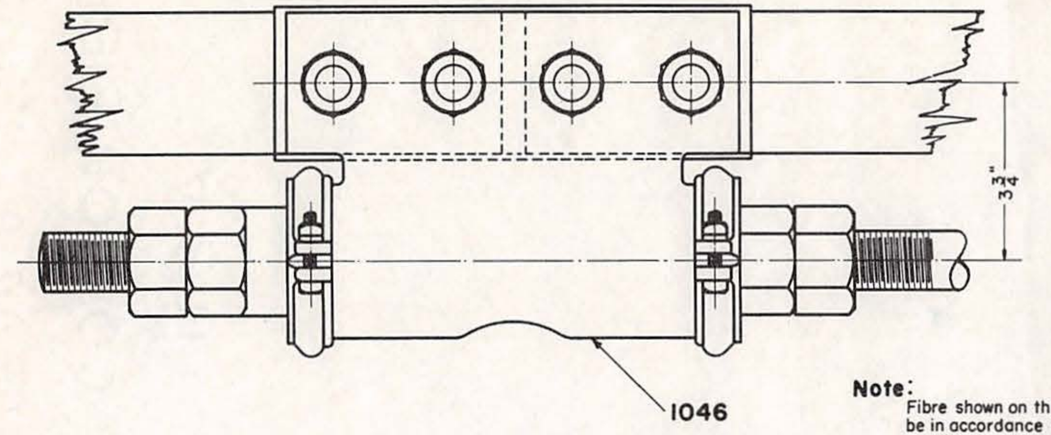
INSULATION PLATE (Fibre)-1042



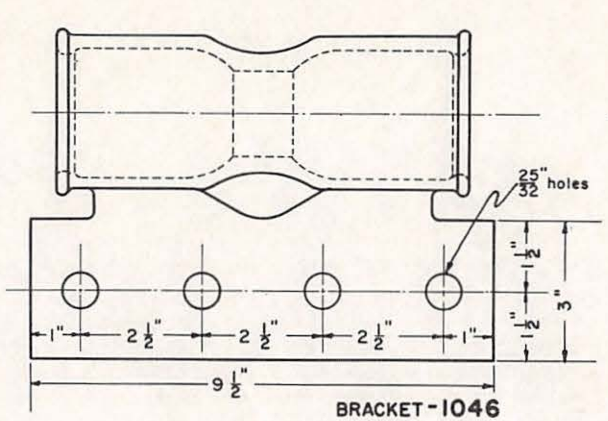
JAM NUT-1043



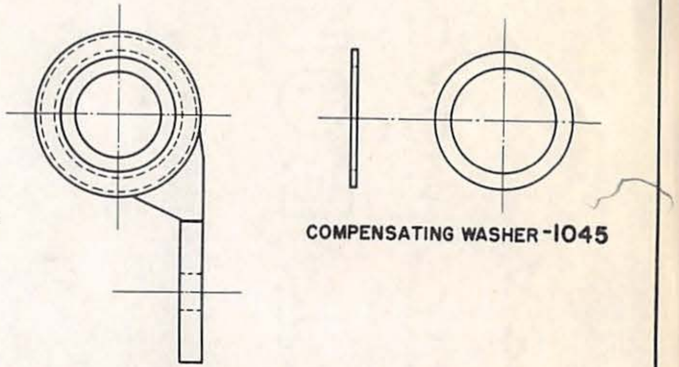
END CAP-1044



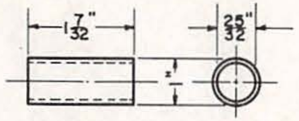
Note:
Fibre shown on this drawing shall be in accordance with AAR Signal Section specification 13.


25/32" holes
1 1/2"
1 1/2"
3"
1"
2 1/2"
2 1/2"
2 1/2"
1"
9 1/2"

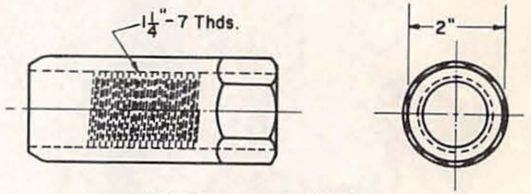
BRACKET-1046



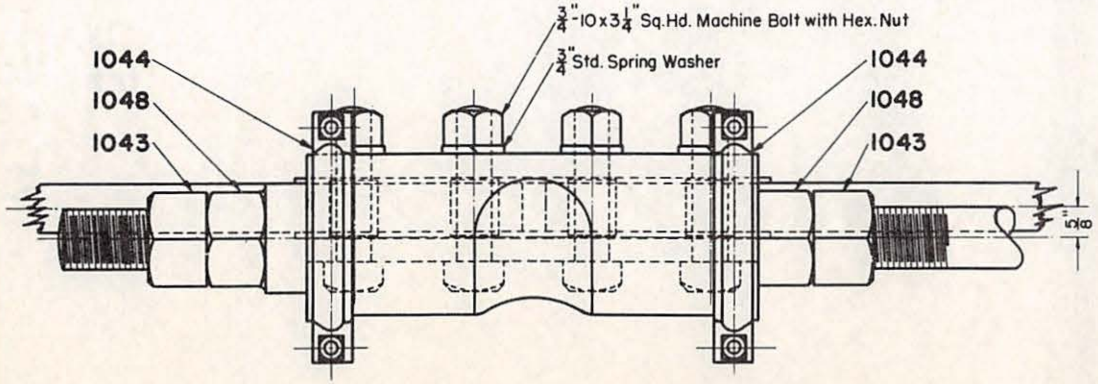
COMPENSATING WASHER-1045

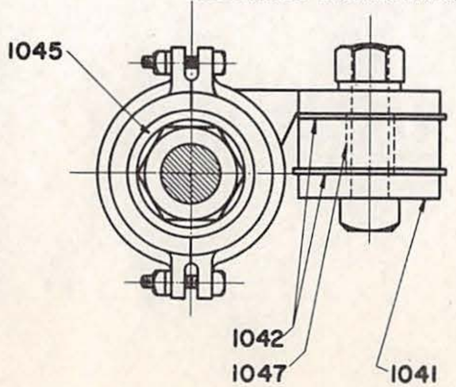


INSULATION BUSHING (Fibre)-1047



ADJUSTING NUT-1048


3/4"-10x3 1/4" Sq.Hd. Machine Bolt with Hex. Nut
3/4" Std. Spring Washer
1044
1048
1043
1044
1048
1043
5/8"


1045
1042
1047
1041

Method of applying Switch Point Adjuster

Approved: Chief Eng'r. Maintenance

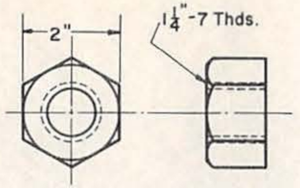
Approved: Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

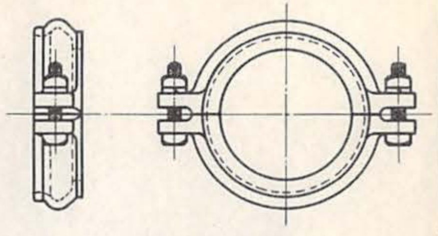
DETAILS AND METHOD OF APPLYING
3-BE BOSSERT SWITCH POINT ADJUSTER

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 23, 1950

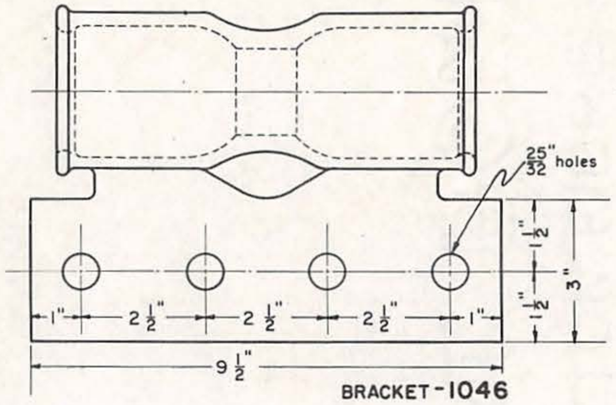
Adopted 4-26-50.


2"
$1\frac{1}{4}$"-7 Thds.

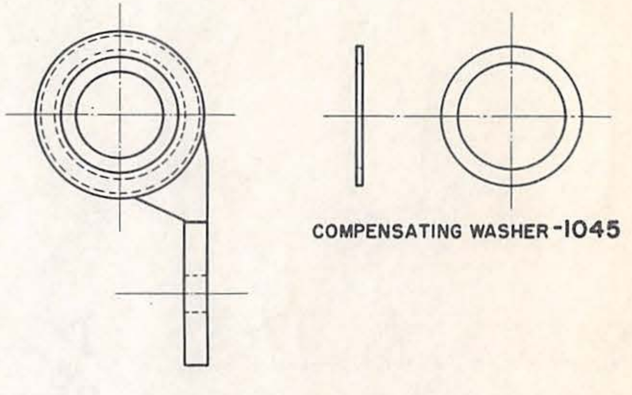
JAM NUT-1043



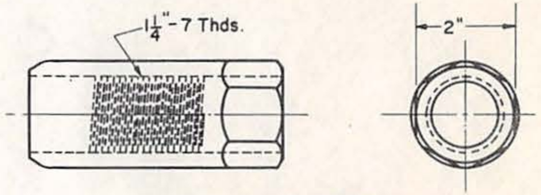
END CAP-1044


$\frac{25}{32}$" holes
1"
$2\frac{1}{2}$"
$2\frac{1}{2}$"
$2\frac{1}{2}$"
1"
$1\frac{1}{2}$"
$1\frac{1}{2}$"
3"
$9\frac{1}{2}$"

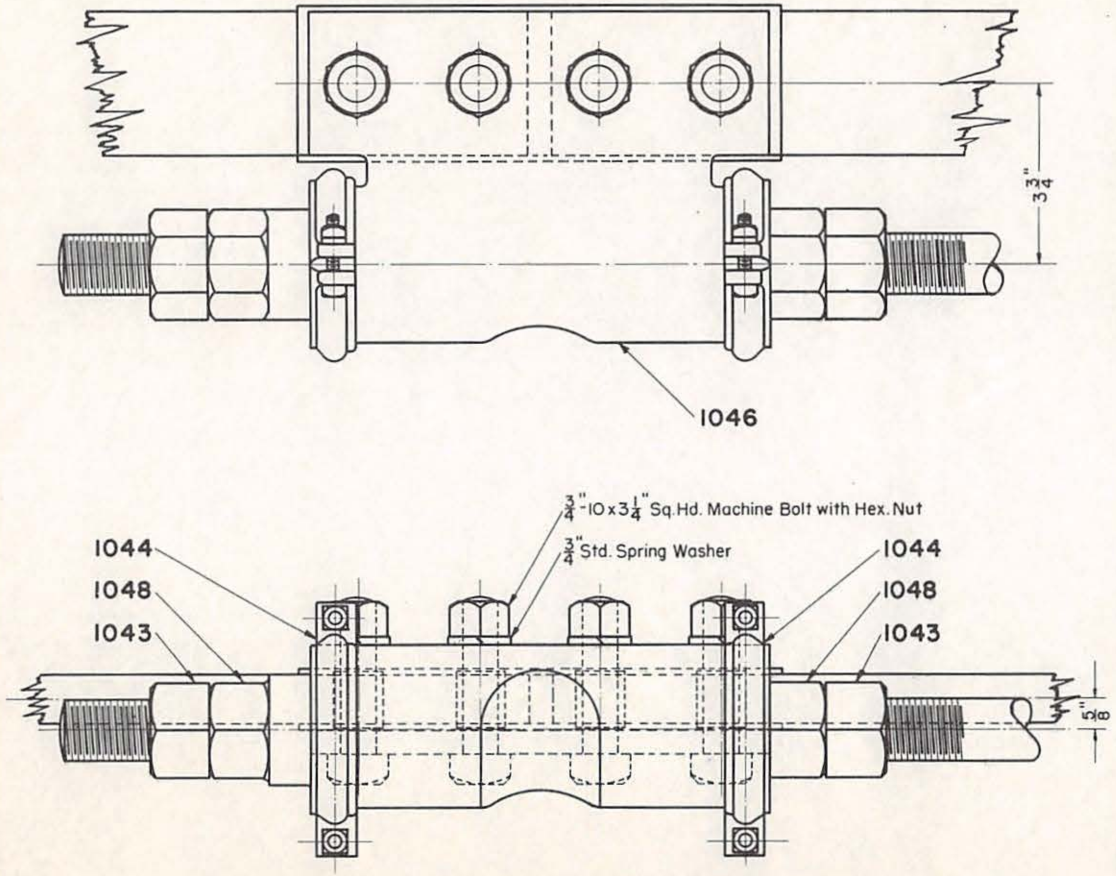
BRACKET-1046



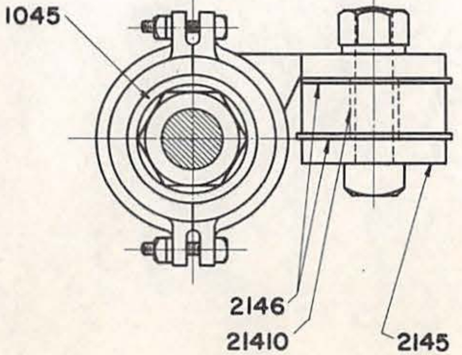
COMPENSATING WASHER-1045


$1\frac{1}{4}$"-7 Thds.
2"

ADJUSTING NUT-1048


$3\frac{3}{4}$"
1046
$\frac{3}{4}$"-10x$3\frac{1}{4}$" Sq.Hd. Machine Bolt with Hex. Nut
$\frac{3}{4}$" Std. Spring Washer
1044
1048
1043
1044
1048
1043
$\frac{5}{8}$"

Method of applying Switch Point Adjuster


1045
2146
21410
2145

Approved: Chief Eng'r. Maintenance

Approved: Chief Eng'r. Comm. & Sigs.

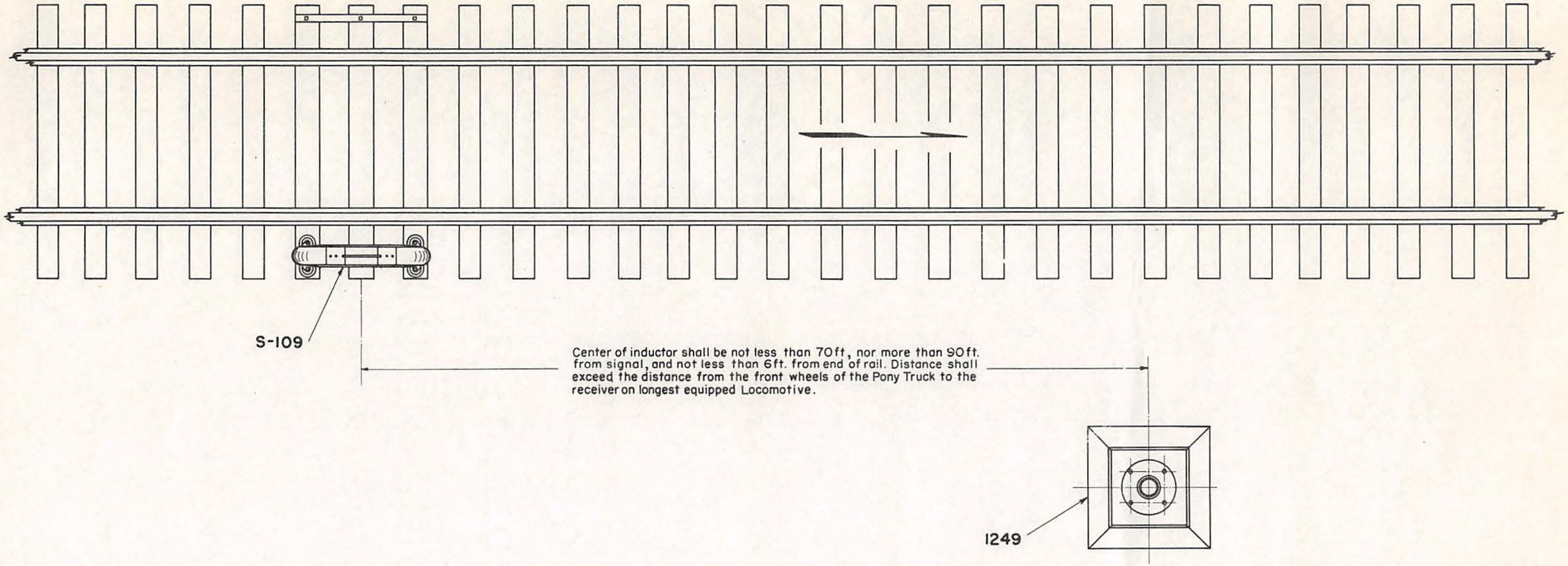
BALTIMORE & OHIO RAILROAD

DETAILS AND METHOD OF APPLYING
3-BE BOSSERT SWITCH POINT ADJUSTER

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 23, 1950

Adopted 4-26-50.
Revised 9-18-50: account details for insulation shown on plan S-214.

S-104-A

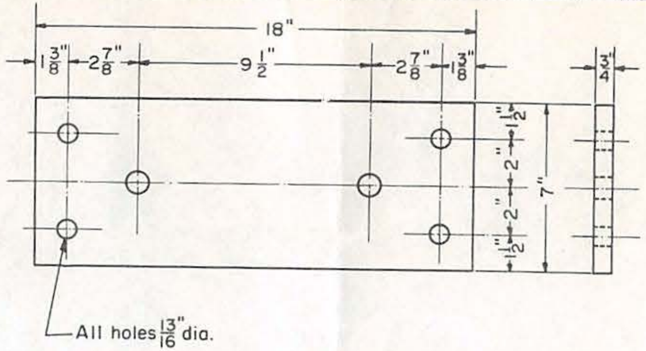


Center of inductor shall be not less than 70ft, nor more than 90ft. from signal, and not less than 6ft. from end of rail. Distance shall exceed the distance from the front wheels of the Pony Truck to the receiver on longest equipped Locomotive.

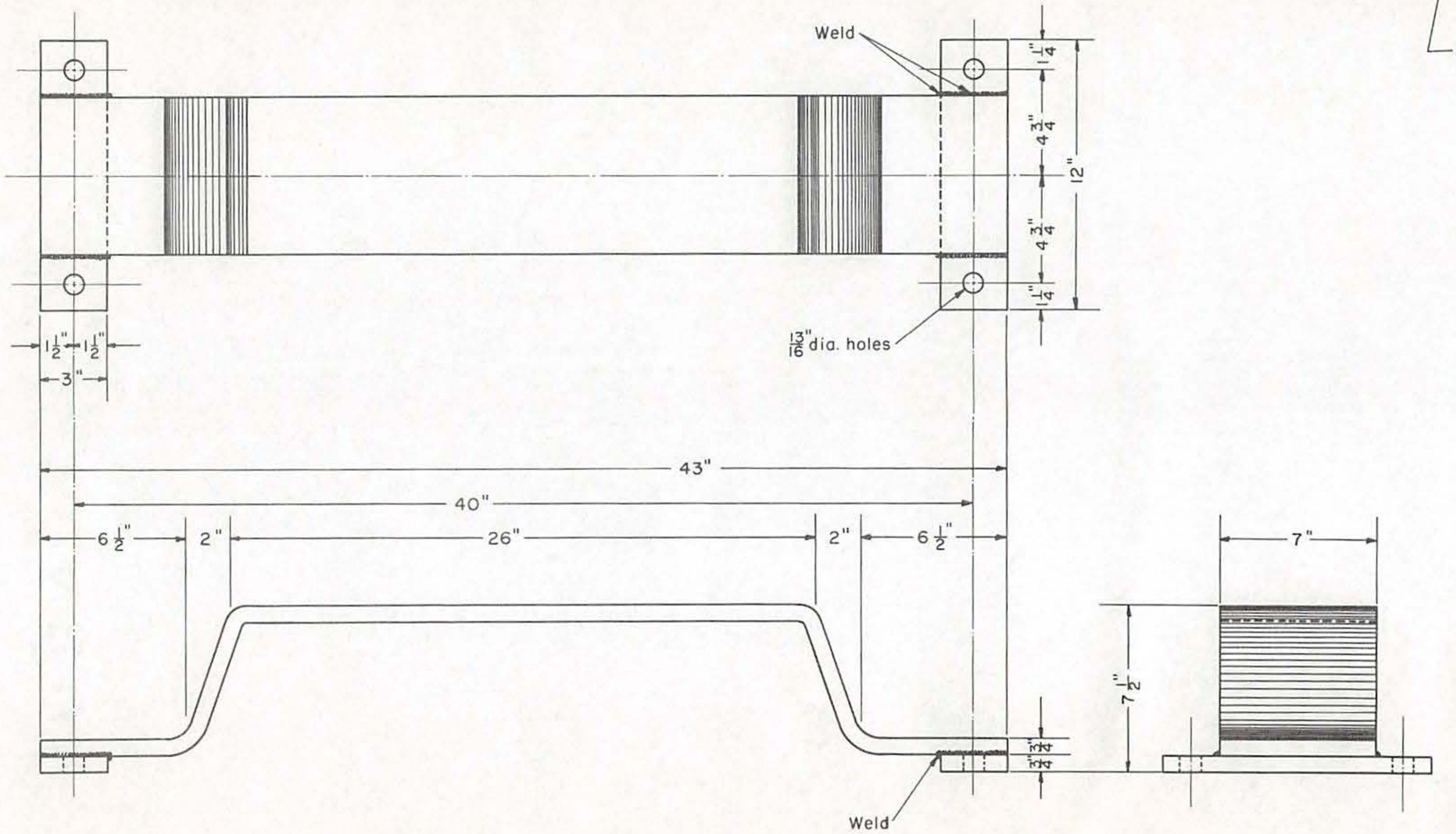
Approved:
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
LOCATION OF TRAIN CONTROL INDUCTOR
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Feb. 15, 1951.

Adopted: May 15, 1951.


18"
1 3/8"
2 7/8"
9 1/2"
2 7/8"
1 3/8"
3/4"
1 1/2"
2"
2"
1 1/2"
7"
All holes 13/16" dia.

BASE PLATE - 1061
Material: C-1020 Steel


Weld
1 1/4"
4 3/4"
4 3/4"
1 1/4"
12"
13/16" dia. holes
1 1/2"
1 1/2"
3"
43"
40"
6 1/2"
2"
26"
2"
6 1/2"
3/4"
3/4"
Weld
7"
7 1/2"

DUMMY INDUCTOR - 1060
Material: C-1020 Steel

Approved: O.B. Harrison
Chief Eng'r. Maintenance

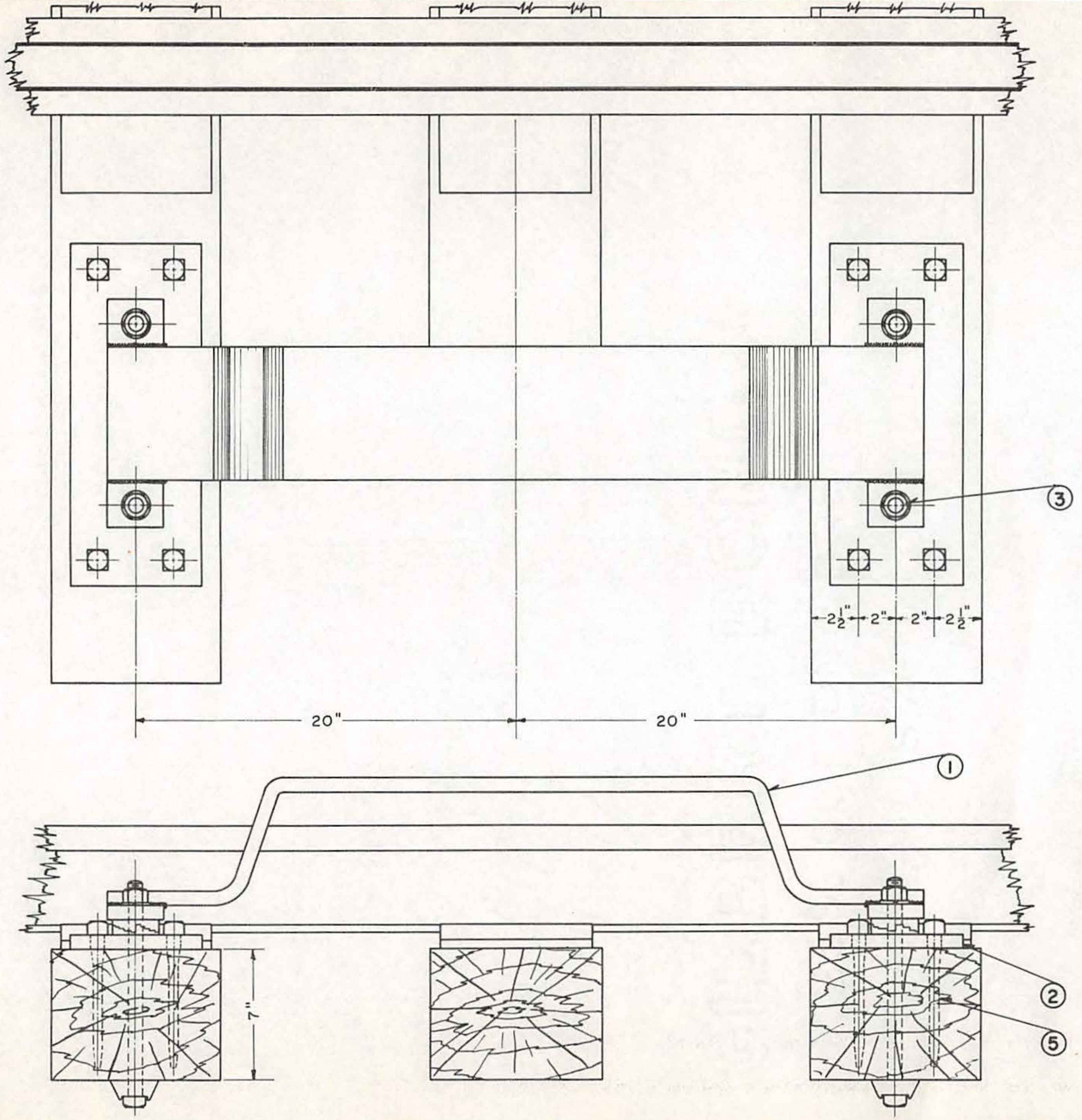
Approved: A.S. Hunt
Chief Eng'r. Comm. & Sigs.

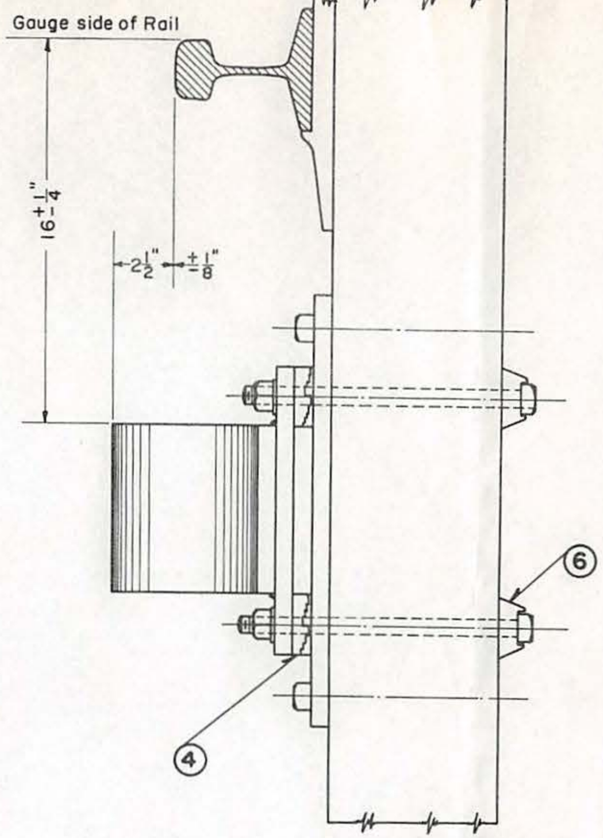
BALTIMORE & OHIO RAILROAD

DETAIL OF DUMMY INDUCTOR

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 17, 1951

Adopted 5-15-51.





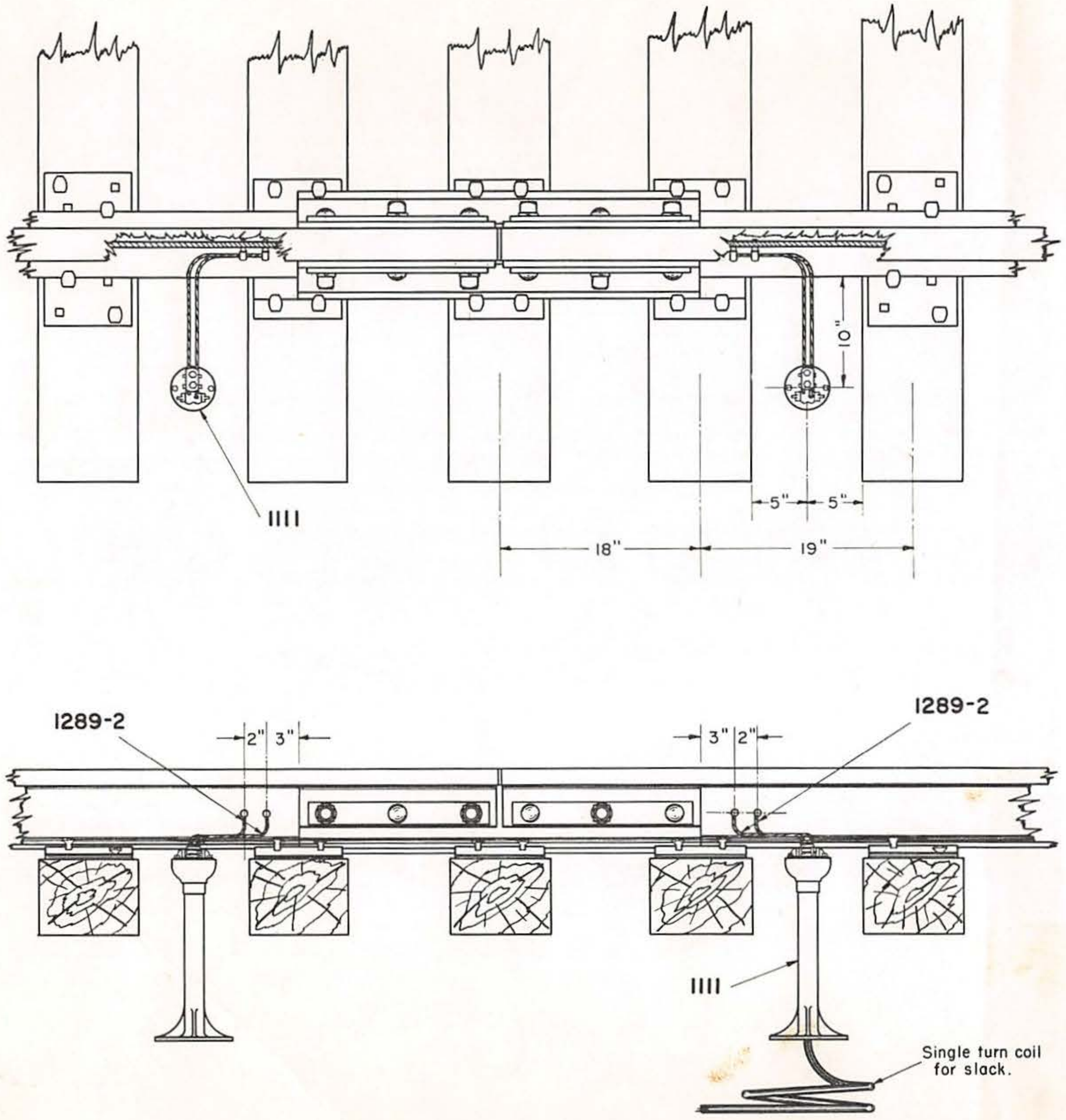
ITEM	REQD.	DESCRIPTION	DRAWING
1	1	Dummy Inductor No.1060.	S-106
2	2	Base Plate No.1061.	S-106
3	4	3/4"x11-1/2" Sq.Hd.Machine Bolt with Hex.Nut.	
4	4	Type "S" Hercules Compensater (O.S.Flath Co.)	
5	8	Galvanized Lag Screw Spike No.13811	S-382
6	4	Cast-Iron Washers No.C12398	S-76140-A

Approved: ______________
Chief Engr. Maintenance

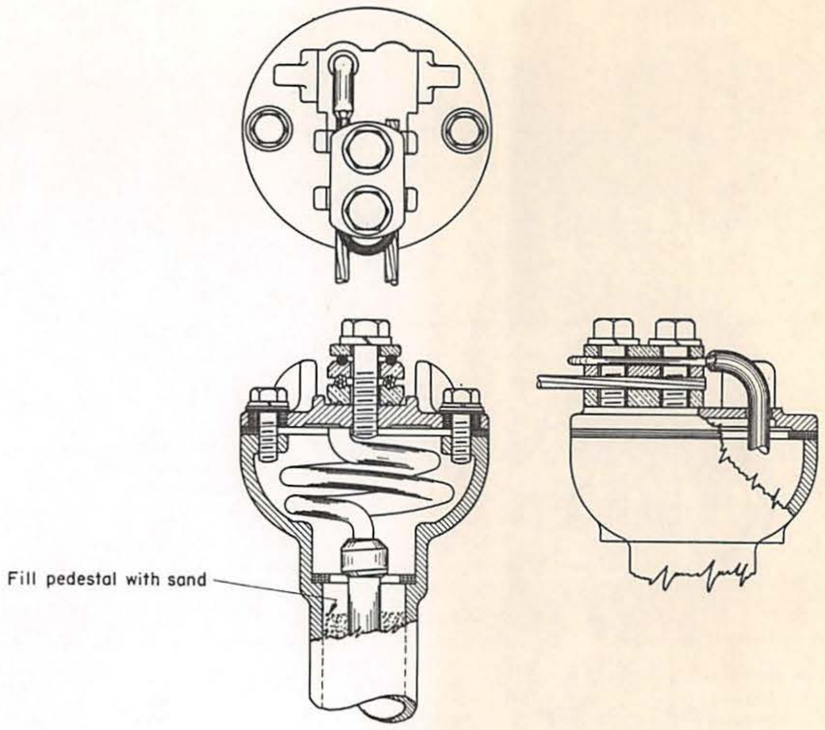
Approved: ______________
Chief Engr. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
LAYOUT FOR DUMMY INDUCTOR
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
May 8, 1951

Adopted: May 15, 1951.



ARRANGEMENT NO. 1080



DETAIL OF CONNECTION FOR APPLICATION SHOWN ON THIS DRAWING

NOTES:

Single conductor underground cable shall conform to current Instructions I-100.

Cable shall be installed in accordance with current Instructions I-131.

When in place, connections and top of bootleg shall be given a heavy coat of NO-OX-ID "A" special compound.

Clamp bolts shall be tightened securely when first installed and again tightened within 10 days thereafter. Following this the clamp bolts shall be tested for tightness not less than every 6 months.

Approved: ARiley
Chief Engineer

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

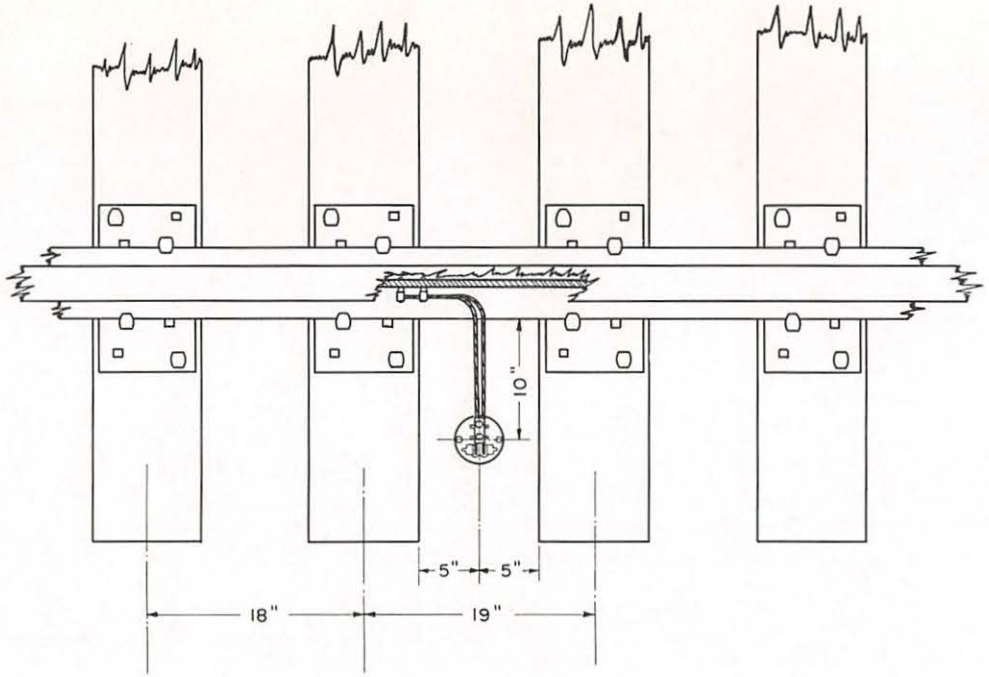
METHOD OF TERMINATING U.G. CABLE AND RAIL CONNECTORS

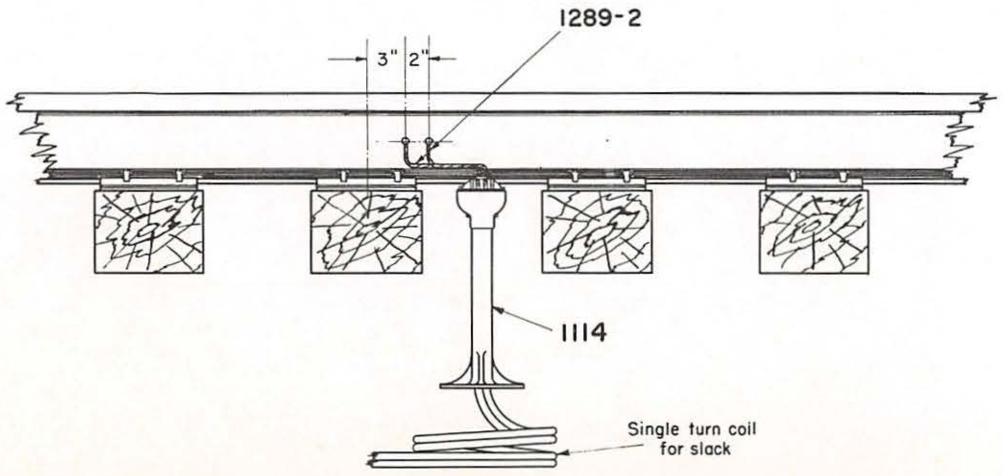
Office of Signal Engineer
Baltimore, Md.
Dec. 8, 1958

Sheet No. 1

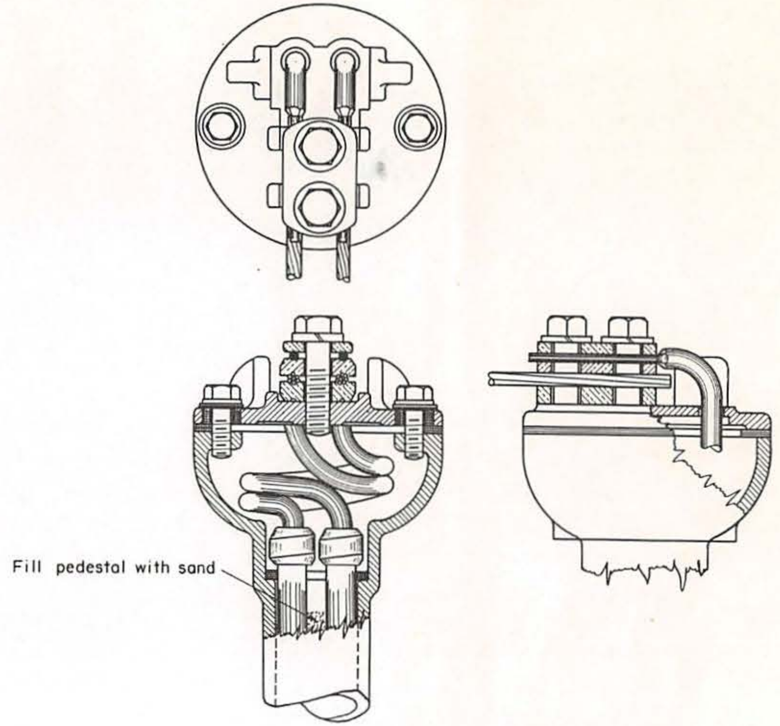
S-108-D

Plan made Nov. 4, 1949 supersedes F -111-A.
9-19-50: Revised account Spec. C-1 removed.
5-16-51: Revised account Connector No. 1289-2 changed, 1289-1 removed.
12-8-58: Joint made Full Continuous Insulated.





ARRANGEMENT NO. 1081



DETAIL OF CONNECTION FOR APPLICATION SHOWN ON THIS DRAWING

NOTES:

Single conductor underground cables shall conform to current Instructions I-100.

Cable shall be installed in accordance with current Instructions I-131.

When in place, connections and top of bootleg shall be given a heavy coat of NO-OX-ID "A" special compound.

Clamp bolts shall be tightened securely when first installed and again tightened within 10 days thereafter. Following this the clamp bolts shall be tested for tightness not less than every 6 months.

Approved: A. Riley
Chief Engineer

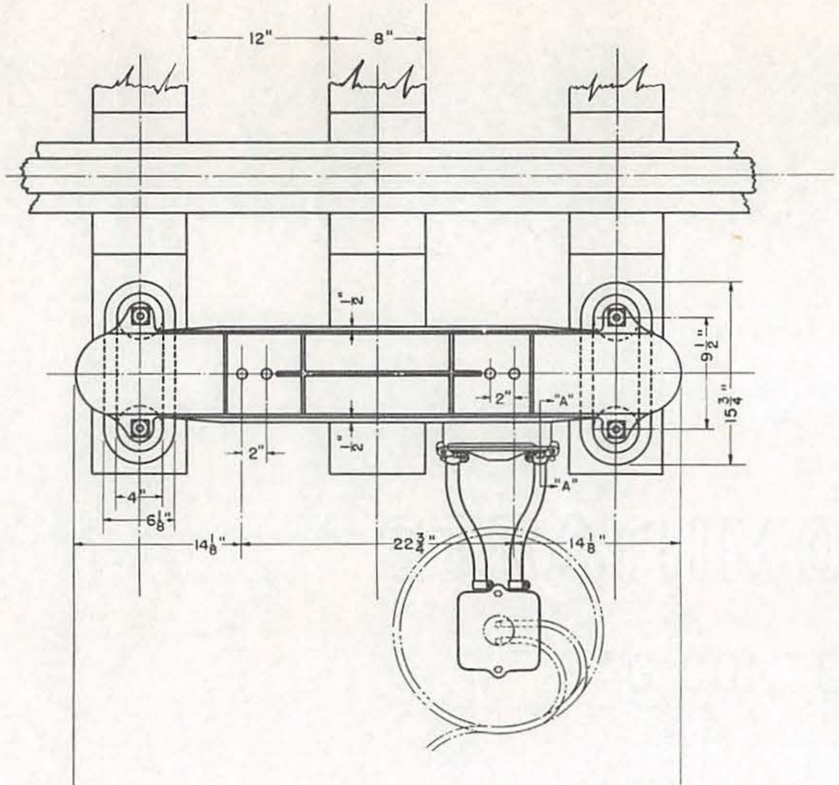
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
METHOD OF TERMINATING U.G. CABLE AND RAIL CONNECTORS
Office of Signal Engineer
Baltimore, Md.
Dec. 8, 1958.

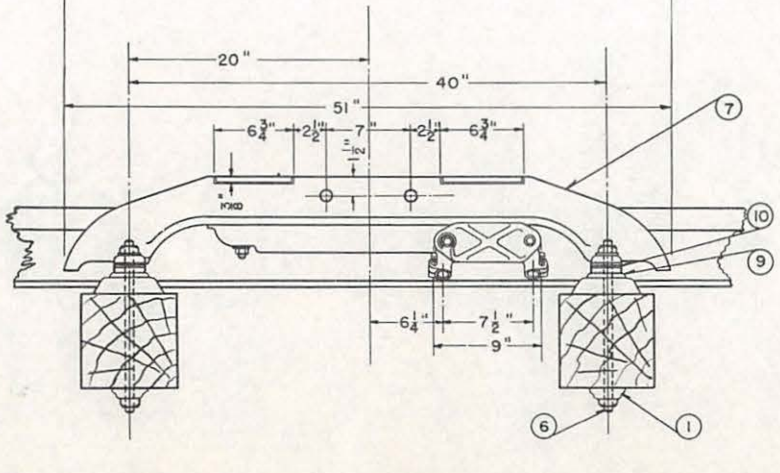
Sheet No. 2

S-108-D

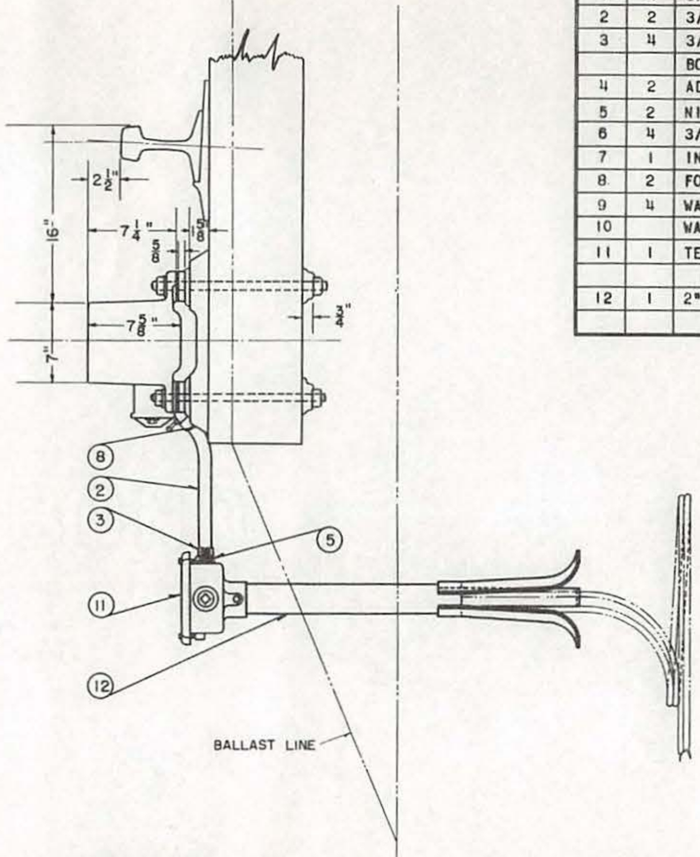
9-19-50 : Revised account Spec. C-I removed.
5-16-51 : Revised account Connector No. 1289-2 changed, 1289-1 r[illegible]d.



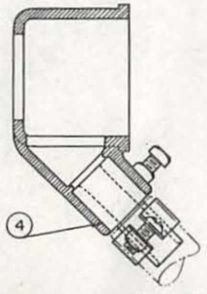
12"
8"
2"
"A"
2"
"A"
1/2"
1/2"
$9\frac{1}{2}$"
$15\frac{3}{4}$"
4"
$6\frac{1}{8}$"
$14\frac{1}{8}$"
$22\frac{3}{4}$"
$14\frac{1}{8}$"



20"
40"
51"
$6\frac{3}{4}$"
$2\frac{1}{2}$"
7"
$2\frac{1}{2}$"
$6\frac{3}{4}$"
1/2"
⑦
⑩
⑨
$6\frac{1}{4}$"
$7\frac{1}{2}$"
9"
⑥
①



16"
$2\frac{1}{2}$"
$7\frac{1}{4}$"
5/8"
5/8"
$7\frac{5}{8}$"
7"
3/4"
⑧
②
③
⑤
⑪
⑫
BALLAST LINE



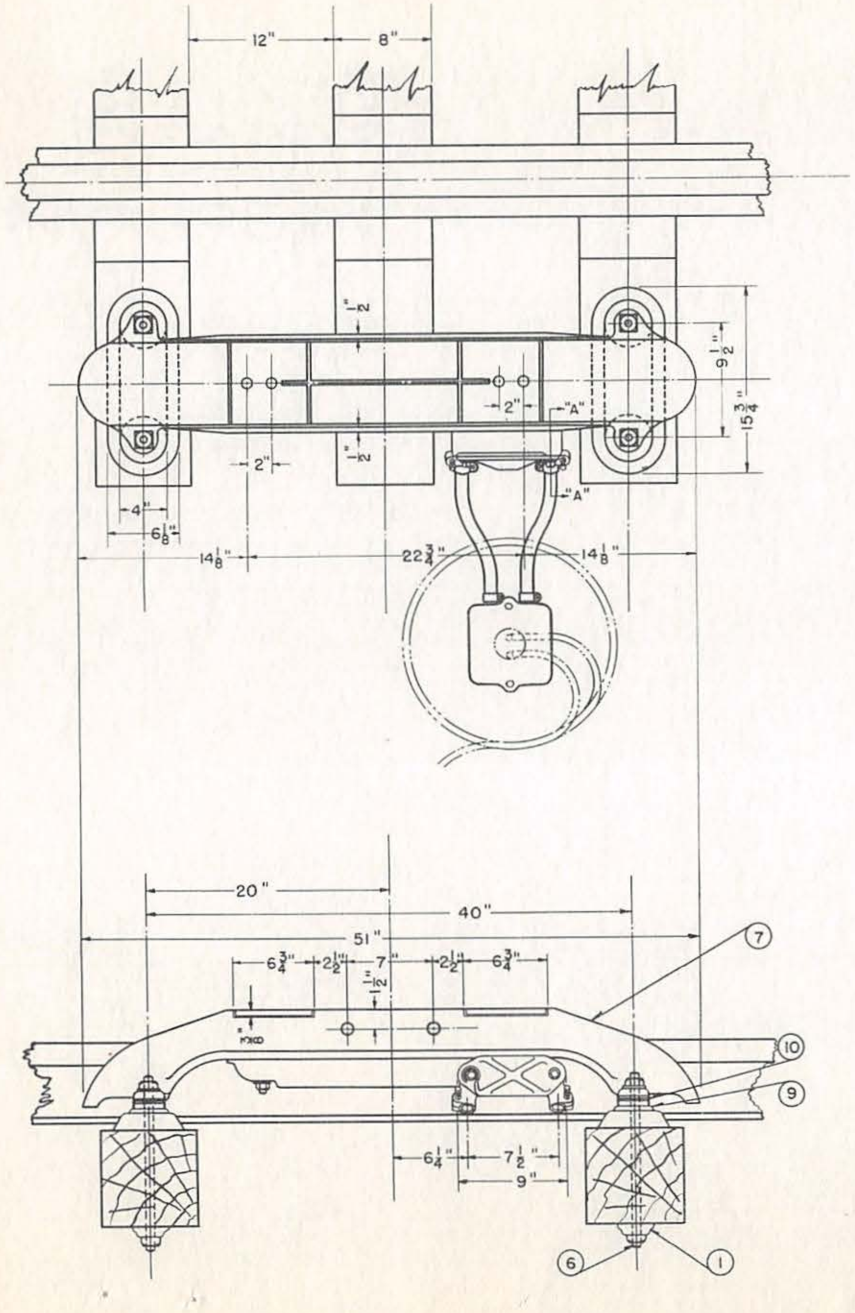
SECTION "A-A"
CONNECTION OF SLEEVE TO OUTLET BOX

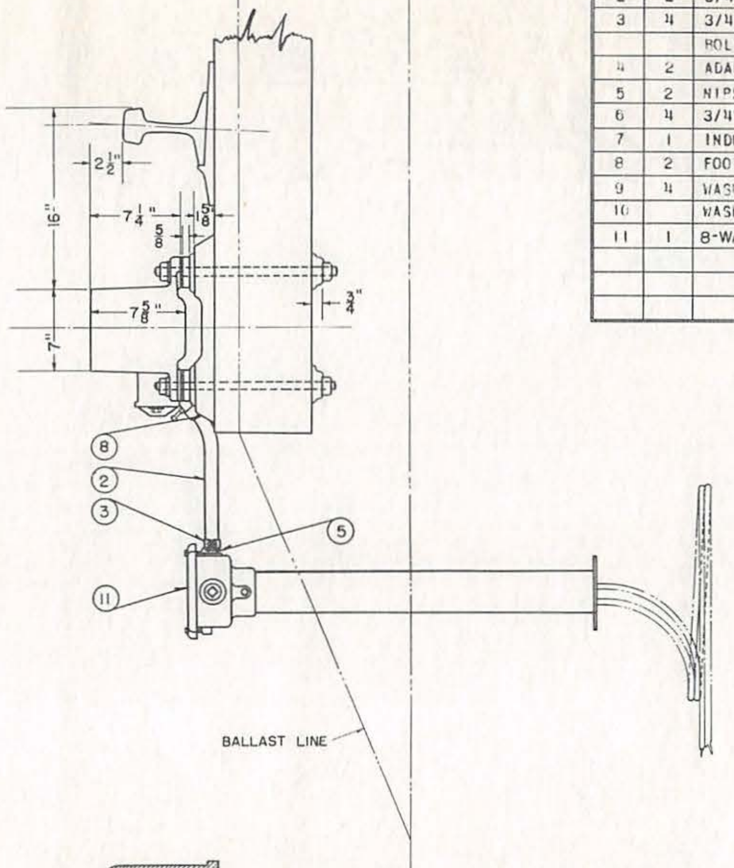
MATERIAL REQUIRED FOR INDUCTOR LAY-OUT					
ITEM	REQ'D.	NAME	MFG.	REF.	PLAN NO.
1	4	3/4" CAST IRON WASHERS		AAR	1458-C
2	2	3/4 " X 12" HOSE	G.R.S.	52313	56950-1
3	4	3/4 " HOSE CLAMPS WITH 1/4" X 1/2" STOVE BOLTS R.H.	G.R.S.	439593	56950-1
4	2	ADAPTER SLEEVE 3/4"	G.R.S.	569971	56950-1
5	2	NIPPLE SLEEVE 1/2"	G.R.S.	56997	56950-1
6	4	3/4" 15" D.E. BOLTS, WITH HEX NUTS			
7	1	INDUCTOR COMPLETE	G.R.S.	A	L0701
8	2	FOOT PLATES	G.R.S.	8	L0705
9	4	WASHER (CAST 15/16" THICK)	G.R.S.	3	L0705
10		WASHERS (TYPE & QUAN. VARIES WITH RAIL SECT.)			
11	1	TER. BOX COMPLETE WITH 2 TER. & WITHOUT 1/2" PIPE PLUG.	G.R.S.		52918-7
12	1	2" PIPE PEDESTOL x 3'-0" LONG	G.R.S.		52918-7

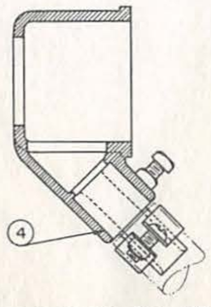
APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INDUCTOR LAYOUT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JUNE 21, 1946

S-109


12"
8"
2½"
9½"
15¾"
2"
"A"
2"
4"
6⅛"
14⅛"
22¾"
14⅛"
20"
40"
51"
6¾"
2½"
7"
2½"
6¾"
1½"
6¼"
7½"
9"
⑦
⑩
⑨
⑥
①


2½"
16"
7¼"
1⅝"
⅝"
7⅝"
¾"
7"
⑧
②
③
⑤
⑪
BALLAST LINE



SECTION "A-A"
CONNECTION OF SLEEVE TO OUTLET BOX

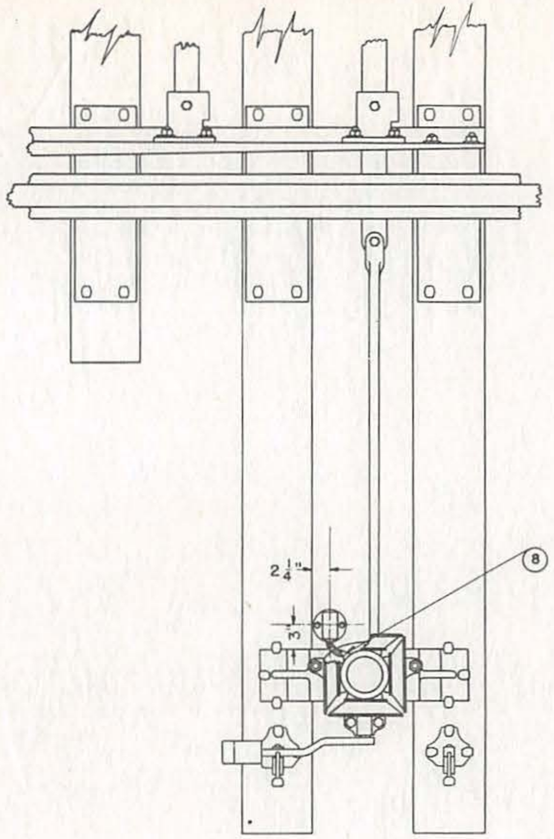
MATERIAL REQUIRED FOR INDUCTOR LAY-OUT					
ITEM	REQ'D.	NAME	MFG.	REF.	PLAN NO.
1	4	3/4" CAST IRON WASHERS		C12398	S-76140-A
2	2	3/4" X 12" HOSE	G. R. S.	52313	56950-1
3	4	3/4" HOSE CLAMPS WITH 1/4" X 1/2" STOVE			
		BOLTS R.H.	G. R. S.	439593	56950-1
4	2	ADAPTER SLEEVE 3/4"	G. R. S.	569974	56950-1
5	2	NIPPLE SLEEVE 1/2"	G. R. S.	56997	56950-1
6	4	3/4" 15" D.E. BOLTS, WITH HEX NUTS			
7	1	INDUCTOR COMPLETE	G. R. S.	A	L0701
8	2	FOOT PLATES	G. R. S.	B	L0705
9	4	WASHER (CAST 15/16" THICK)	G. R. S.	3	L0703
10		WASHERS (TYPE & QUAN. VARIES WITH RAIL SECT.)			
11	1	8-WAY JUNCTION BOX ASSEMBLY NO. 2282			S-228SH2

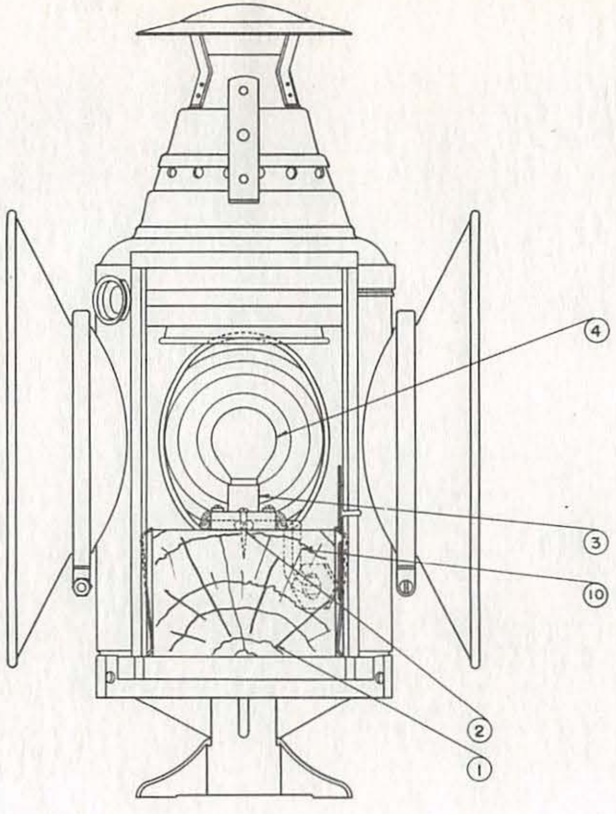
APPROVED: A.J. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INDUCTOR LAYOUT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JUNE 21, 1946

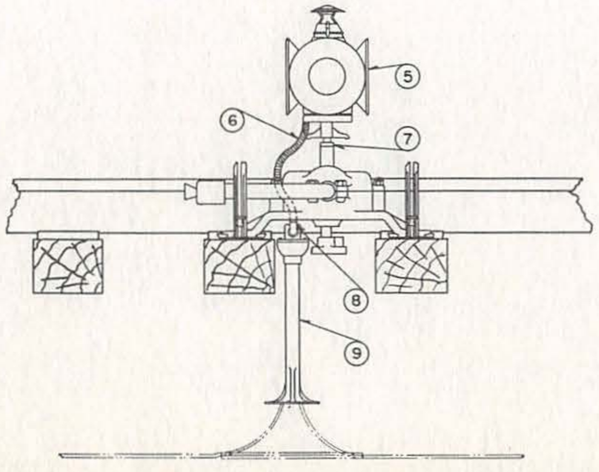
Revised 3-1-50 account Pipe Pedestol changed to 3"
Revised 12-13-51: Junction Box A bly No. added.

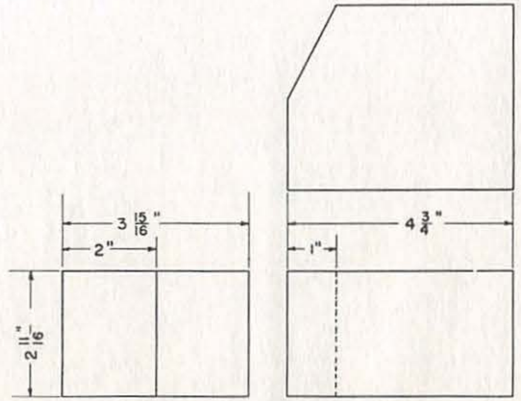
S-109-B





MATERIAL REQUIRED FOR ELECTRIC LIGHTED SWITCH LAMP					
ITEM	REQ'D.	NAME	MFG.	REF.	PLAN NO.
1	1	BASE BLOCK 2-11/16"x 3-15/16"x 4-3/4"	B&O	1101	S-110
2	2	#6 x 1-1/4" R. H. WOOD SCREWS			S-110
3	1	MORSE EUREKA BAYONET SOCKET (CAT. 102)	GRYBR.	21	PG. 232
4	1	13-1/2 VOLT-.25 AMP. LAMP BULB		ITEM 1	S-113
5	1	SWITCH LAMP		AAR	1460-B
6	1	1/2" FLEXSTEEL FLEX. CONDUIT x 18" (CAT. 102)	GRYBR.		PG. 112
7	1	SWITCH LAMP ADAPTER			
8	2	T&B-90° TITE-BITE CONNECTORS (CAT. 102)	GRYBR.	323-V	PG. 115
9	1	BOOTLEG	RACO.	507-1	507 SHT. 1
10	5 FT.	SINGLE COND'R. #14 A.W.G. (19 STRAND)		W-3	1-100





1101 - BASE BLOCK
WOOD

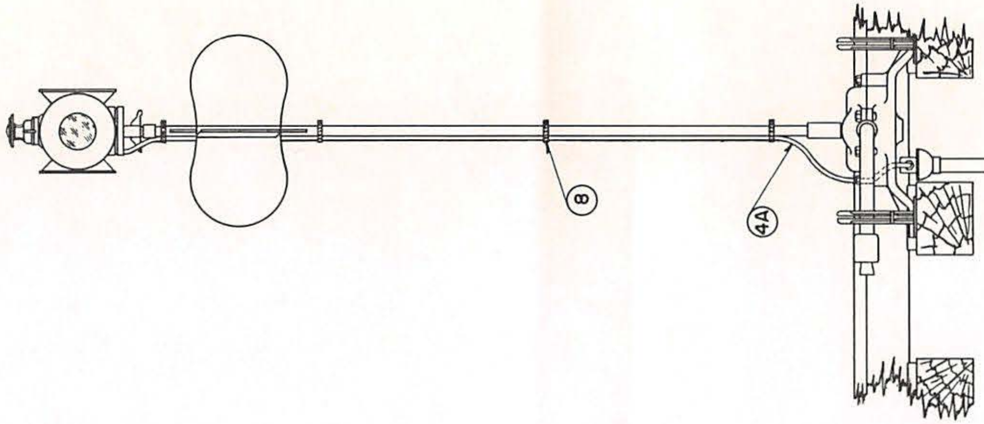
APPROVED: A.S.Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

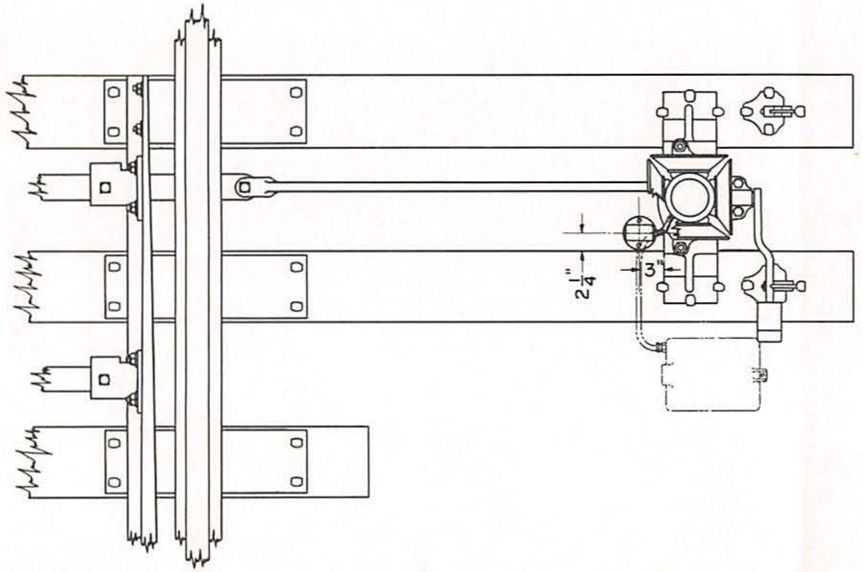
ELECTRIC LIGHTED SWITCH LAMP

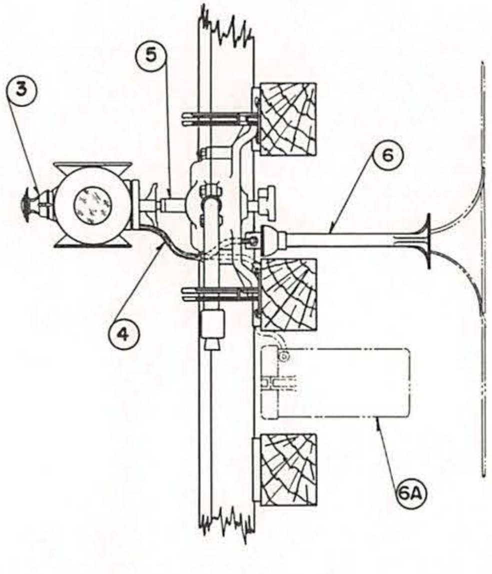
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 15, 1946

S-110



End View Showing Mounting for Intermediate Target





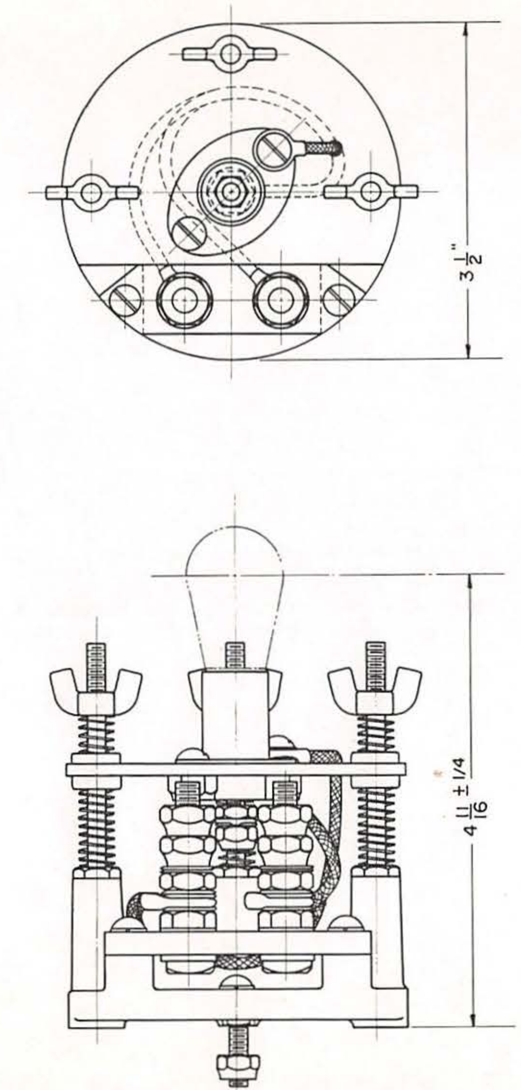
11-27-51: New plan made account lamp socket changed.
12-27-57: Item 6A revised, 6B removed.

Approved: A. L. Jordan
Signal Engineer

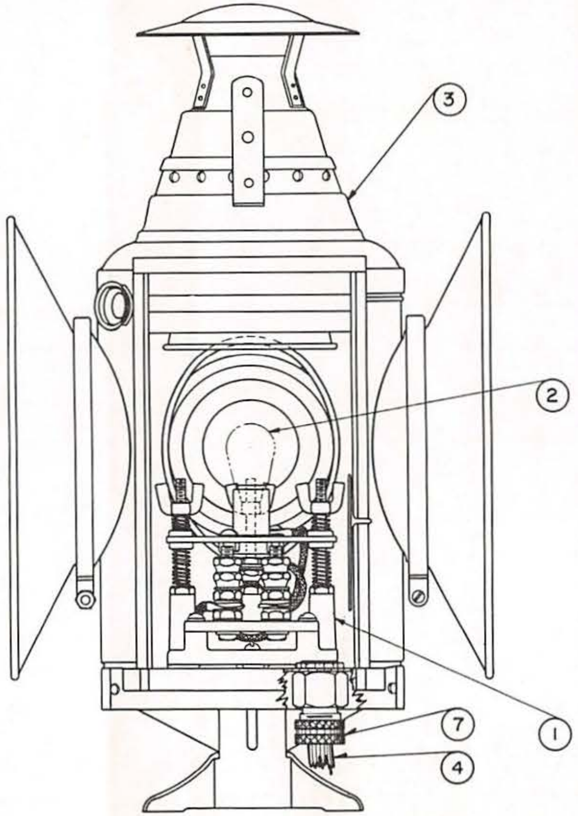
BALTIMORE & OHIO RAILROAD
ELECTRIC LIGHTED SWITCH LAMP
Office of Signal Engineer
Baltimore, Md.
Nov. 27, 1951.

Sheet No. 1

S-110-C



ADJUSTABLE CUSHIONED LAMP ADAPTER
Raco No. 564-12



Material Required for Electric Lighted Low Switch Stand (Lighted by Commercial Power)					
Item	Req'd.	Name	Mfg.	Ref.	Plan No.
1	1	Adjustable Cushioned Lamp Adapter	Raco	564-12	564 sh.1
2	1	13-1/2" Volt, .25 Amp. Lamp Bulb		Item 1	S-113-D
3	1	Switch Lamp AAR 1460			S-400-B
4		3'-0" 2 cond'r. Cable (See Note)			
5	1	Switch Lamp Adapter Tip			
6	1	Bootleg with 564-10 Cable Connector	Raco	507	507 sh.1
7	1	Cable Connector	Raco	564-10	564 sh.1
(Lighted by Battery)					
2A	1	2.9 Volt, .150 Amp. Lamp Bulb		Item 9	S-113-D
4A		5'-0" 2 cond'r. Cable (See Note)			
6A	1	Battery Box with 564-10 Cable Connector, for Edison Carbonaire 2-S-J-1 or National Carbon Battery T-2600.	Raco	564-55	564 sh.16

Material Required for Electric Lighted Intermediate Switch Stand Lamp (Lighted by Commercial Power)					
Item	Req'd.	Name	Mfg.	Ref.	Plan No.
1	1	Adjustable Cushioned Lamp Adapter	Raco	564-12	564 sh.1
2	1	13-1/2 Volt, .25 Amp. Lamp Bulb		Item 1	S-113-D
3	1	Switch Lamp AAR 1460			S-400-B
4		8'-0" 2 cond'r. Cable (See Note)			
5	1	Switch Lamp Adapter Tip			
6	1	Bootleg with 564-10 Connector	Raco	507	507 sh.1
7	1	Cable Connector	Raco	564-10	564 sh.1
(Lighted by Battery)					
2A	1	2.9 Volt, .150 Amp. Lamp Bulb		Item 9	S-113-D
4A		10'-0" 2 condr. Cable (See Note)			
6A	1	Battery Box with 564-10 Cable Connector, for Edison Carbonaire 2-S-J-1 or National Carbon Battery T-2600.	Raco	564-55	564 sh.16
8		3'-0" Perf. Strapping Grybr. Cat. No. 104, pg. 177		410C	

Approved: A. L. Jordan
Signal Engineer

Notes:

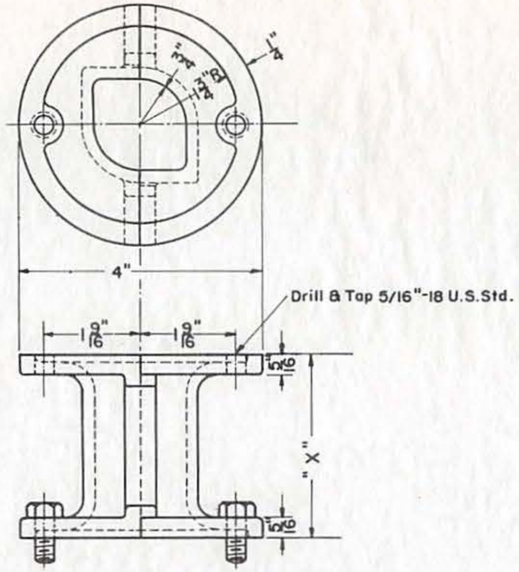
Items 4 and 4A to be, 2-Conductor No.16, 19 x .0117" okoloy coated copper, 2/64" okonite, 1/64" okoprene, cabled together with 4/64" okoprene belt. O.D. .495" or equivalent

BALTIMORE & OHIO RAILROAD
ELECTRIC LIGHTED SWITCH LAMP
Office of Signal Engineer
Baltimore, Md.
Nov. 27, 1951.

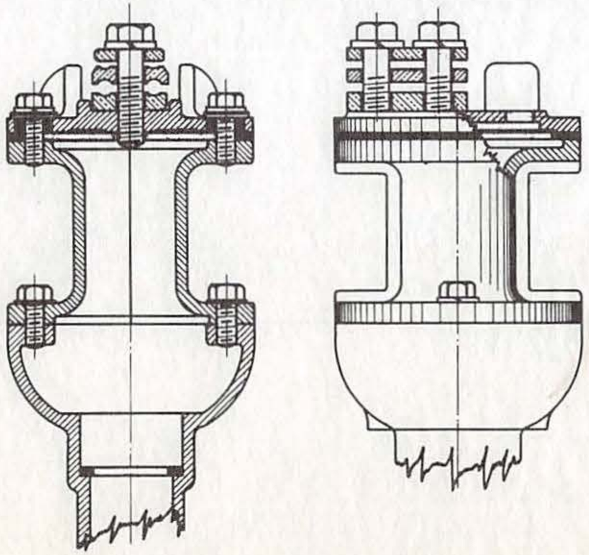
11-27-51 : New plan made account lamp socket changed.
12-27-57: Item 6A revised, 6B removed.
5-19-58: S-113-C changed to S-113-D.

Sheet No. 2

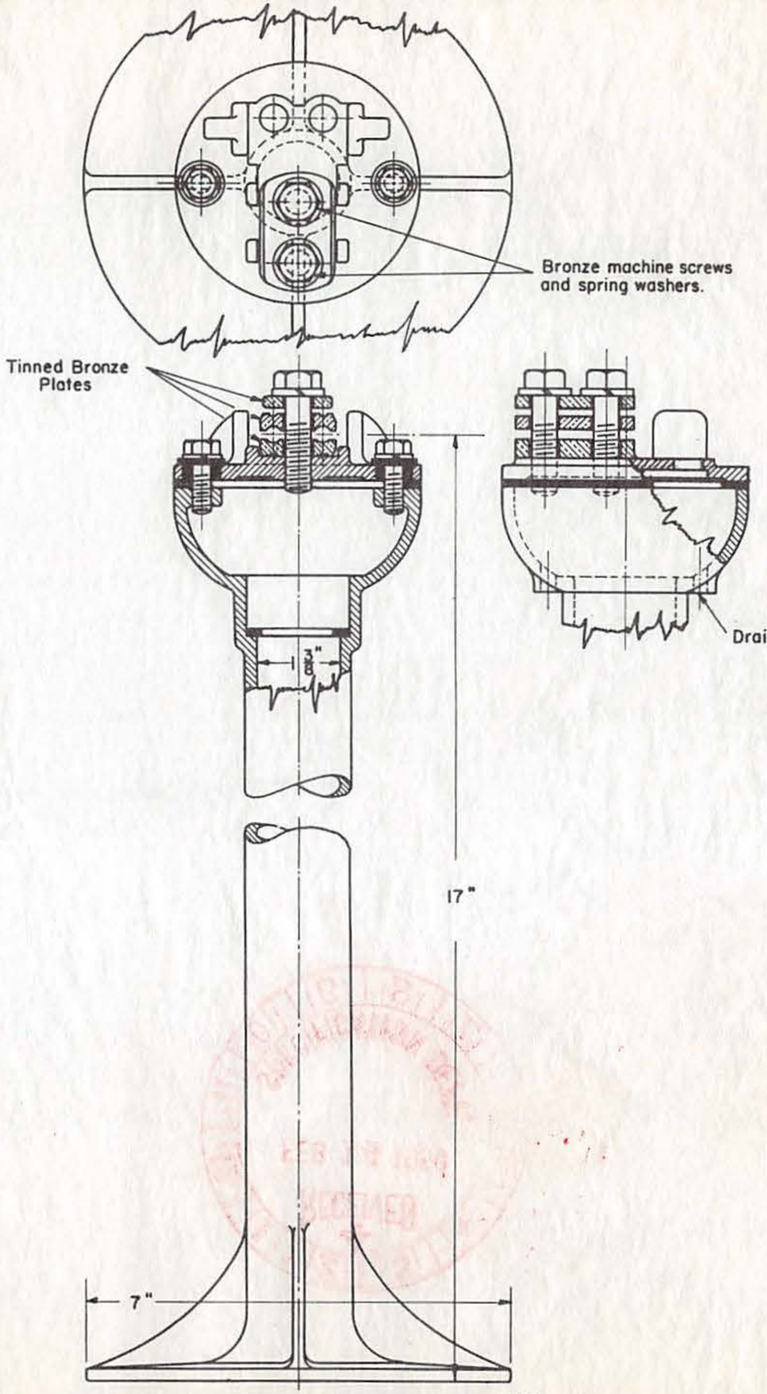
S-110-C


1/4"
3/4"
3/8"
3/4"
4"
Drill & Tap 5/16"-18 U.S.Std.
1 9/16"
9/16"
5/16
"X"
5/16

RACO BOOTLEG EXTENSION NO. 460-8 (X=2") - 1112
RACO BOOTLEG EXTENSION NO. 460-9 (X=3") - 1113



APPLICATION OF BOOTLEG EXTENSION


Bronze machine screws
and spring washers.
Tinned Bronze
Plates
17"
1 3/8"
Drain hole
7"

RACO NO. 445-1 TRENCH CABLE BOOTLEG - 1111

RECEIVED

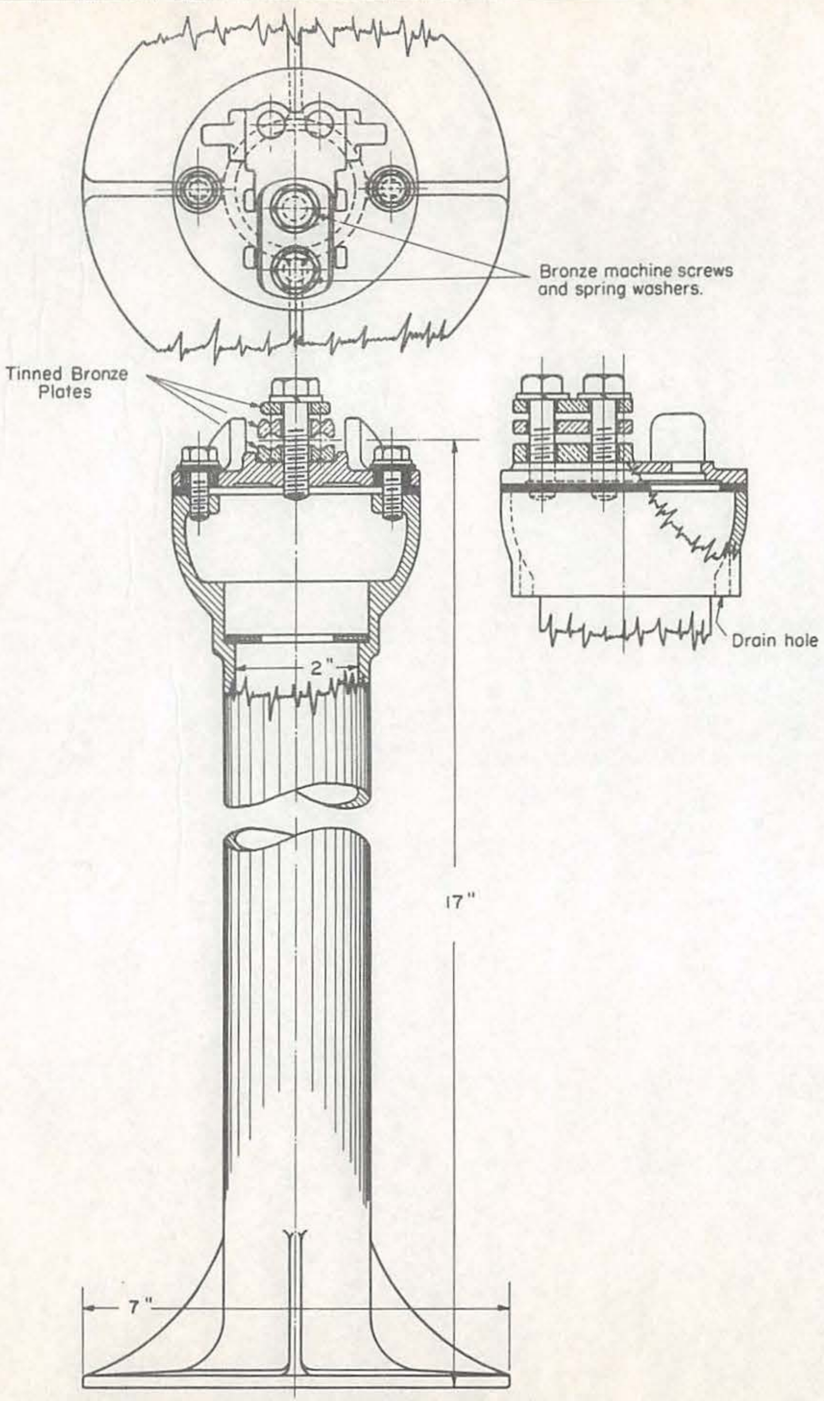
Approved: G. C. Harrison
Chief Eng'r. Maintenance

Approved: A. H. Hunt
Chief Eng'r. Comm. & Sigs.

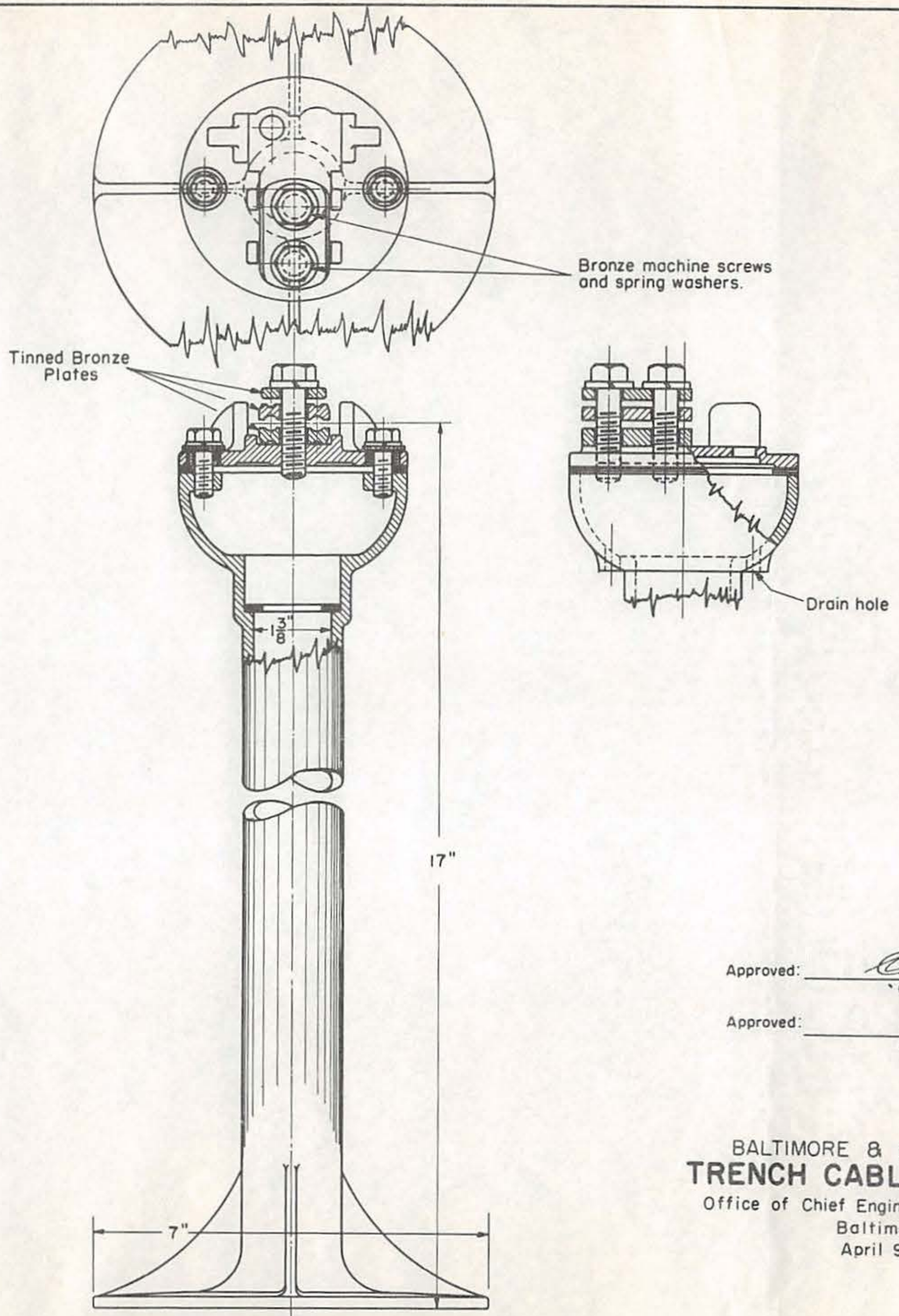
BALTIMORE & OHIO RAILROAD
TRENCH CABLE BOOTLEGS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 4, 1949

S-111B

RECEIVED
FEB 14 1950
SPECIFICATION DEPT.


Bronze machine screws and spring washers.
Tinned Bronze Plates
Drain hole
2"
17"
7"

RACO NO. 445-53 TRENCH CABLE BOOTLEG—1114


Bronze machine screws and spring washers.
Tinned Bronze Plates
Drain hole
$1\frac{3}{8}$"
17"
7"

RACO NO. 445-1 TRENCH CABLE BOOTLEG-1111

Approved: Chief Eng'r. Maintenance

Approved: Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

TRENCH CABLE BOOTLEGS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 9, 1951.

S-111C

Revised 4-9-51 account adding
Bootleg No. 1114.

ADOPTED: 2-5-47

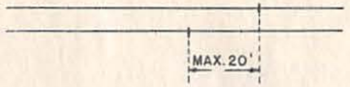


FIG. 1

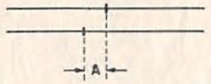


FIG. 2

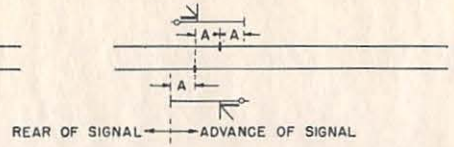
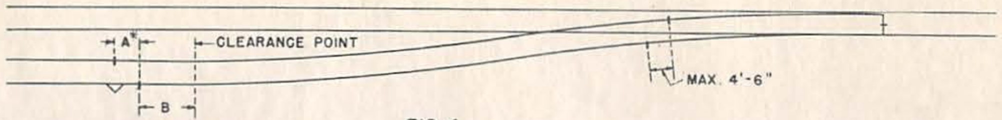


FIG. 3



* WHERE DERAIL IS NOT REQUIRED THIS DISTANCE MUST NOT EXCEED 20'.

FIG. 4

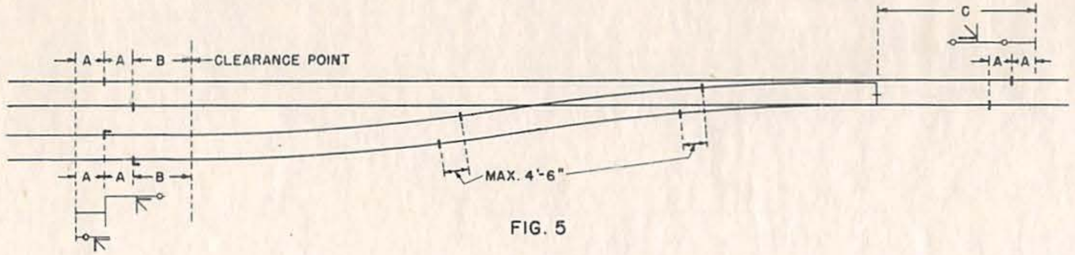


FIG. 5

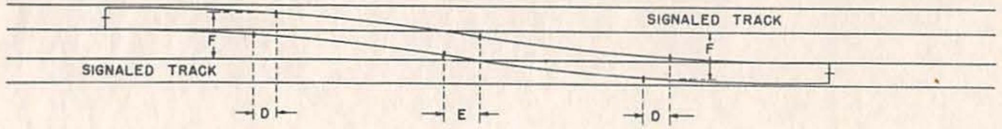


FIG. 6

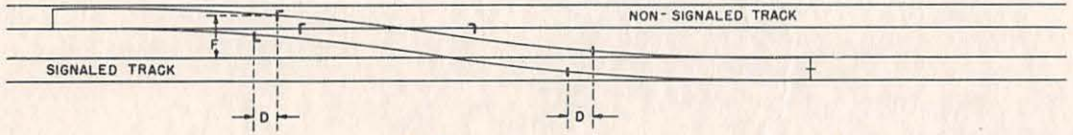


FIG. 7

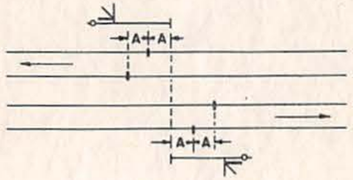


FIG. 9

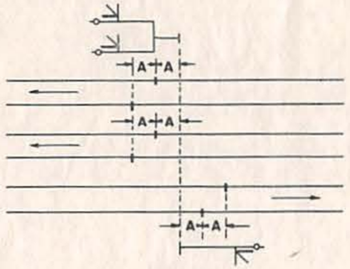


FIG. 10

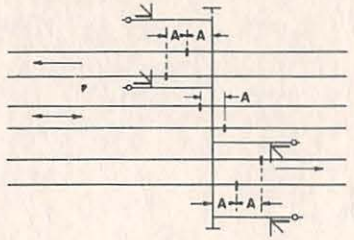


FIG. 11

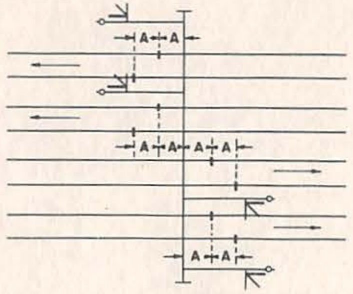


FIG. 12

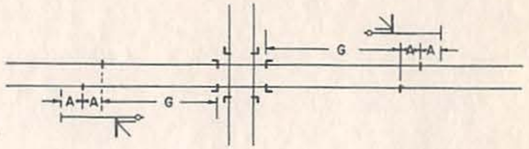


FIG. 13

FIG. 1 - CUT SECTION FOR NON-SIGNALED TRACK.
FIG. 2 - CUT SECTION FOR SIGNALED TRACK.
FIG. 3 - SIGNAL LOCATION, SINGLE TRACK.
FIG. 4 - NON-SIGNALED TURNOUT FOR SINGLE OR MULTIPLE TRACK.
FIG. 5 - SIGNALED TURNOUT FOR SINGLE OR MULTIPLE TRACK.
FIG. 6 - NON-INTERLOCKED CROSSOVER BETWEEN SIGNALED TRACKS.
FIG. 7 - NON-INTERLOCKED CROSSOVER BETWEEN ONE SIGNALED TRACK AND ONE NON-SIGNALED TRACK.

FIG. 9 - SIGNAL LOCATION, TWO TRACKS.
FIG. 10- SIGNAL LOCATION FOR THREE TRACKS SIGNALED IN ONE DIRECTION.
FIG. 11- SIGNAL LOCATION FOR THREE TRACKS WITH ONE TRACK SIGNALED IN EITHER DIRECTION.
FIG. 12- SIGNAL LOCATION FOR FOUR TRACKS SIGNALED IN ONE DIRECTION.
FIG. 13-*RAILROAD GRADE CROSSING, SINGLE OR MULTIPLE TRACK.

NOTES:-

A - MAY VARY FROM 0' TO 5'0". PROPULSION RAILS TO OVERLAP.
B = NOT LESS THAN 12'0"
C - MAY VARY FROM 30'0" TO 50'0"
D - MAY VARY FROM 0' TO 4'6"
E - MAY VARY FROM 0' TO 7'0"
F-- NOT LESS THAN 11'0"
* G - NOT LESS THAN 55'0"
H - NOT LESS THAN 100' WHERE PRACTICABLE

EXCEPT IN FIGURES 4-6-7-19-20-21 AND 22 JOINTS MAY BE REVERSED AS TO RAILS.

* NO TRACK CIRCUIT SHALL BE LESS THAN 55 FEET IN LENGTH.

SPECIAL ARRANGEMENT OF JOINTS WHERE REQUIRED SHALL BE SHOWN IN DETAIL ON CIRCUIT PLAN.

INSULATED RAIL JOINTS SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH MAINTENANCE OF WAY DEPT. INSTRUCTIONS, PARAGRAPHS 315 TO 324.

NOTES CONTINUED:-

INSULATED JOINTS MUST NEVER BE PLACED ON THE HEEL OF SWITCHES OR ON THE ENDS OF FROGS OR CROSSING ARMS, OR SO AS TO INTERFERE WITH STANDARD TIE PLATE CONSTRUCTION. WHERE ABOVE CONDITIONS CANNOT BE COMPLIED WITH, EACH CASE WITH DETAILED PLAN OR SUGGESTION SHALL BE SUBMITTED THROUGH REGULAR CHANNELS FOR APPROVAL.

TURNOUT-FROG NO.	CLEARANCE POINT FROM POINT OF SWITCH WITH TRACK CENTERS OF:		
	~~12~~ 14 FT	13 FT.	12 FT.
8	170'	162'	154'
10	200'	190'	180'
16	313'	297'	281'
20	390'	370'	350'

APPROVED:
CHIEF ENG'R. MAINTENANCE

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

INSULATED JOINT LOCATION

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 24, 1946

SHEET NO. 1 S-112

ADOPTED 2-5-47

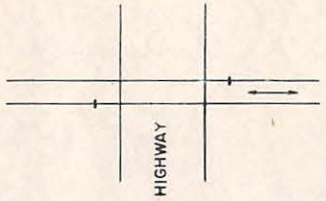


FIG. 14

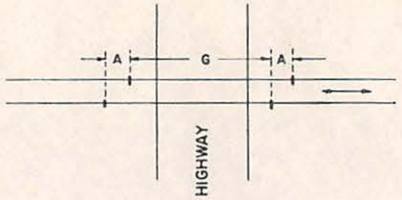

A
G
A
HIGHWAY

FIG. 15

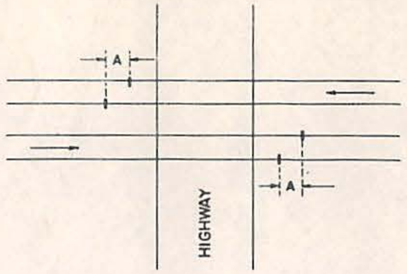


FIG. 16

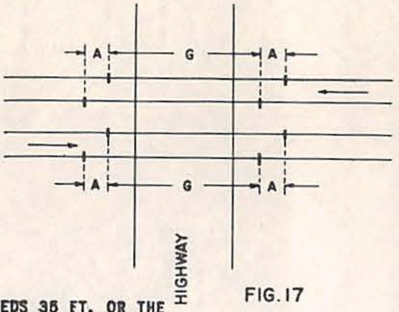

A
G
A
A
G
A
HIGHWAY

FIG. 17

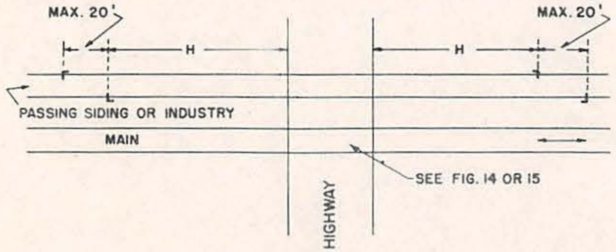

MAX. 20'
H
H
MAX. 20'
PASSING SIDING OR INDUSTRY
MAIN
SEE FIG. 14 OR 15
HIGHWAY

FIG. 18

WHERE THIS DISTANCE EXCEEDS 35 FT. OR THE SHORTEST WHEEL BASE OF AN ENGINE, SPECIAL CIRCUIT SHALL BE INSTALLED.

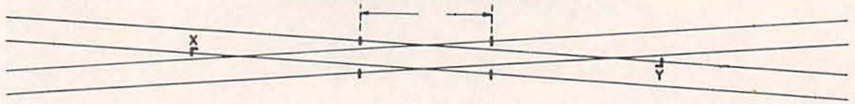


FIG. 19

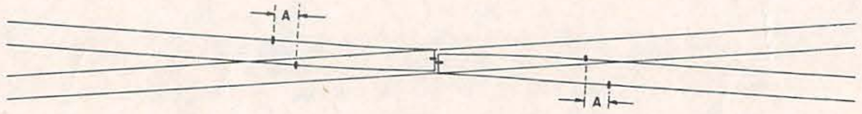


FIG. 20

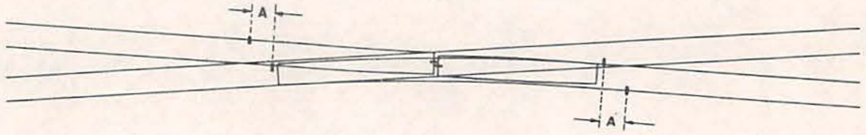


FIG. 21

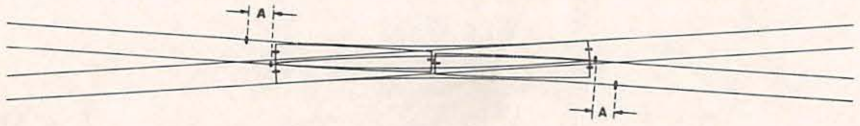


FIG. 22

FIG. 14 - ARRANGEMENT FOR HIGHWAY GRADE CROSSING SIGNALS, NON-SIGNALED TRACK.
FIG. 15 - ARRANGEMENT FOR HIGHWAY GRADE CROSSING SIGNALS, SIGNALED TRACK, OR IN NON-SIGNALED TRACK WHERE AUTOMATIC SHORT ARM GATES ARE INSTALLED.
FIG. 16 - ARRANGEMENT FOR HIGHWAY GRADE CROSSING SIGNALS, MULTIPLE TRACK, SIGNALED OR NON-SIGNALED.
FIG. 17 - ARRANGEMENT FOR HIGHWAY GRADE CROSSING SIGNALS, WITH AUTOMATIC SHORT ARM GATES, MULTIPLE TRACK, SIGNALED OR NON-SIGNALED.
FIG. 18 - ARRANGEMENT FOR HIGHWAY GRADE CROSSING SIGNALS WITH PASSING OR INDUSTRY TRACK, SINGLE OR MULTIPLE TRACK, SIGNALED OR NON-SIGNALED.
FIG. 19 - RIGID CROSSING FROG, DOUBLE RAIL. JOINTS X & Y OMITTED WHEN BOTH TRACKS ARE SIGNALED.
FIG. 20 - MOVABLE POINT CROSSING FROG.
FIG. 21 - SINGLE SLIP SWITCH.
FIG. 22 - DOUBLE SLIP SWITCH.

APPROVED: ______
CHIEF ENG'R. MAINTENANCE

APPROVED: ______
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSULATED JOINT LOCATION
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 24, 1946

SHEET NO. 2 S-112

ADOPTED:-2-5-47

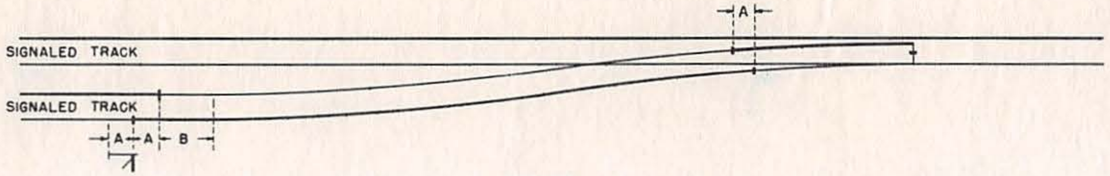

A
SIGNALED TRACK
SIGNALED TRACK
A
A
B

FIG. 25

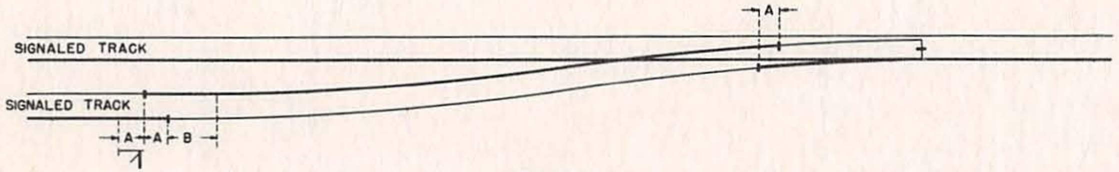

A
SIGNALED TRACK
SIGNALED TRACK
A
A
B

FIG. 26

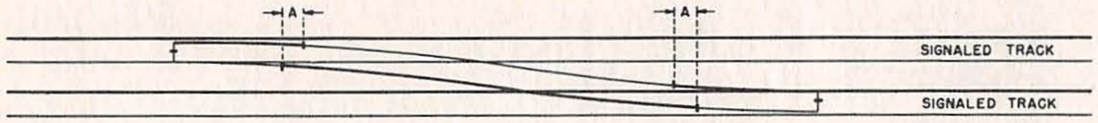

A
A
SIGNALED TRACK
SIGNALED TRACK

FIG. 27

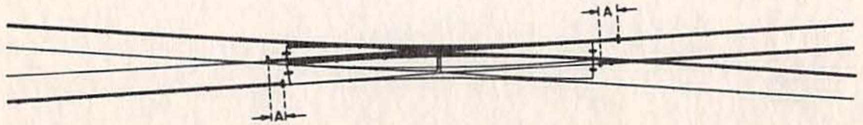


FIG. 28

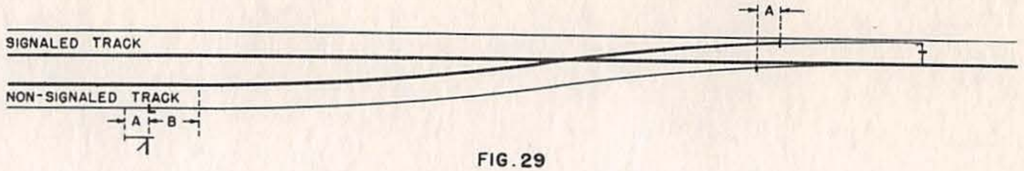

A
SIGNALED TRACK
NON-SIGNALED TRACK
A
B

FIG. 29

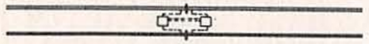


FIG. 30

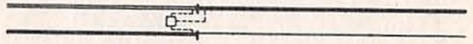


FIG. 31

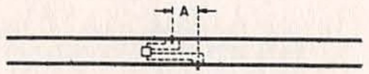


FIG. 32

FIG. 25 - TURNOUT FOR SINGLE RAIL TRACK CIRCUIT, ELECTRIC OPERATION TERRITORY.
FIG. 26 - TURNOUT FOR SINGLE RAIL TRACK CIRCUIT, ELECTRIC OPERATION TERRITORY.
FIG. 27 - CROSSOVER FOR SINGLE RAIL TRACK CIRCUIT, ELECTRIC OPERATION TERRITORY.
FIG. 28 - DOUBLE SLIP SWITCH FOR SINGLE RAIL TRACK CIRCUIT, ELECTRIC OPERATION TERRITORY.
FIG. 29 - TURNOUT FOR SINGLE RAIL TRACK CIRCUIT, ELECTRIC OPERATION TERRITORY.
FIG. 30 - DOUBLE IMPEDANCE BOND, DOUBLE RAIL TRACK CIRCUIT ABUTTING DOUBLE RAIL TRACK CIRCUIT.
FIG. 31 - SINGLE IMPEDANCE BOND, SINGLE RAIL TRACK CIRCUIT ABUTTING DOUBLE RAIL TRACK CIRCUIT.
FIG. 32 - SINGLE IMPEDANCE BOND, DOUBLE RAIL TRACK CIRCUIT ABUTTING NO TRACK CIRCUIT.

SIGNAL RAIL
PROPULSION RAIL
SIGNAL & PROPULSION RAIL

APPROVED:
CHIEF ENG'R. MAINTENANCE

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
INSULATED JOINT LOCATION
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 29, 1946

SHEET NO. 3

S-112

Item No.	Source			Amps. Watts CP	Volts	Bulb	Base	Filament				Life Hours	Rec'm'nded Burning Voltage	Mfr. Desg.	St'd. P'k'g. Quantity	Railroad Use
	GRS Dwg. No.	W-G	US&S PC.No.					Major Sec.	Shape	LCL	Tolerance					
1	34866-6	G	120803	0.25A	13.5	S-8	SC	+	C-2R	1¼	2/64	1000	12.2	RS	100	Semaphore Signals - Indication lights
2	34866-25	G	135722	17W	13.5	S-11	SC		C-2V	1¼	1/64	2000	12.2	RLS	120	Color position light - Highway crossing signals
3		W-G		32CP	12-16	RP-11	SC		C-2R	1¼	2/64	400	11.3	No. 1143	10	Color position light with 30° spredlite lens
4	52879-6	W-G	240199	0.17A	12	T-2	SL.1	+	C-21			1500	10.8	12C	100	Track diagrams - Lever lights
5	48088-5	W-G	120270	3CP	12-16	G-6	SC	+	C-2R	13/16		1000	11.7	No. 67	10	Lever lights - "JN" Toledo, O. and "QN" Washington, D.C.
6		W-G	75679	1.25W	12	G-8	S.Can.	+	C-2V	1		1000	10.8	RS	100	Lever lights - "FN" Newton Falls, O. and "HX" Halethorpe, Md.
7		W-G		.150	2.7	S-8	SC	+	C-2R	1¼	2/64	1000		15A/S8SC	100	Inoperative approach & "Stop" Signals.
8		W-G	69494	10W	115	S-14	S.Med.	+	C-9	2½		1500	100-115	Sign	120	Train order signals - Lever machine, Type "B" Retarders.
9		W-G		.150	2.9	Inside Frosted S-8	SC	+	C-2R	11/4	2/64	1000		15A/S8SC/IF	100	Electric Lighted Switch Lamps.
10	52879-8	W-G		0.17A	12	T-2	SL.1	+	C-21	Green Coating		1500	10.8	12C	100	"NX" and "UR" interlocking levers
11	52879-7	W-G	237073	0.17A	12	T-2	SL.1	+	C-21	Red Coating		1500	10.8	12C	100	"NX" and "UR" interlocking levers
12	57026-2	W-G		0.15A	14	T-3¼	B.Min.	+	C-2R	5/8		200	12.5	No. 1488	10	For Line-O-Lite and "UR" track diagrams
13	57026-3	W-G		0.15A	14	T-3¼	B.Min.	+	C-2R	5/8	Red Coating	200	12.5	No. 1488	10	For Line-O-Lite and "UR" track diagrams
14	47438-14Gr.1	W-G	152591	9W	12	G-16½	2-PS		C-2R	*1.91	1/64	1500	10.8	RLS	60	Position light high signals - P.R.R. 4831
15		W-G	215005	9W	12	CT-7	SC		C-2V	1¼	1/64	1500	10.8	RLS	24	Position light high signals (Style PL-3) P.R.R. 48311
16	34866-32	W-G	208229	21CP	12-16	S-8	SC		C-2R	1¼	.04-.03	500	11.5	No. 1141	10	Position light dwarf signals - P.R.R. 4832
17	52879-5	W-G		.09-.11A	24	T-2	SL.1	+	C-21			1000	21.6	24D	100	C.T.C. Machines
18	48088-6	W-G	116342	3CP	12-16	G-6	DC		C-2R	13/16		1000	11.7	No. 68	10	Lever machine, Type "B" Retarders.

Source:
W—Westinghouse Lamp Co.
G—General Electric Co.
GRS—General Railway Signal Co.
US&S—Union Switch & Signal Co.
Pc. No.—Piece Number
Dwg. No.—Drawing Number

Electrical:
A—Amperes
W—Watts
CP—Spherical Candlepower

Bulb:
Shape—See current AAR Dwg. 1541
Color—Clear unless otherwise noted
Atmosphere—Gas unless otherwise noted
+—Vacuum

Note:
Lamps must be burned continuously at their rated voltage for a period of not less than 30 minutes before being placed in service. At the expiration of this period, any dark or discolored lamps must be discarded.

Voltage should be checked when new lamps are installed.

Base: (See current AAR Dwg. 1541)
B. Min.—Bayonet miniature, single contact
SC—Bayonet candelabra, single contact
S. Min.—Screw miniature
S. Can.—Screw candelabra
S. Med.—Screw medium
SL.1—Slide telephone switchboard type
2-PS—Rebased with 2 pin sleeve
DC—Bayonet candelabra, double contact.

Filament:
MF—Major filament
Shape—See current AAR Dwg. 1541
Note—Plane of base pins at right angles to plane of filament unless otherwise noted
LCL—Light center length in inches
Tolerance—Plus-minus dimensions in inches allowed on LCL. Where no tolerance is shown, manufacturers standards to apply
Material—Tungsten unless otherwise noted
* LCL measured to top of filament.

Life Hours:
Manufacturers laboratory rated average burning hours of a group of lamps tested under specified test conditions

Manufacturers Designation:
RLS—Railroad light signal, visible day and night indication
RS—Railroad signal, visible night indication only

APPROVED: A. L. Jordan
SIGNAL ENGINEER

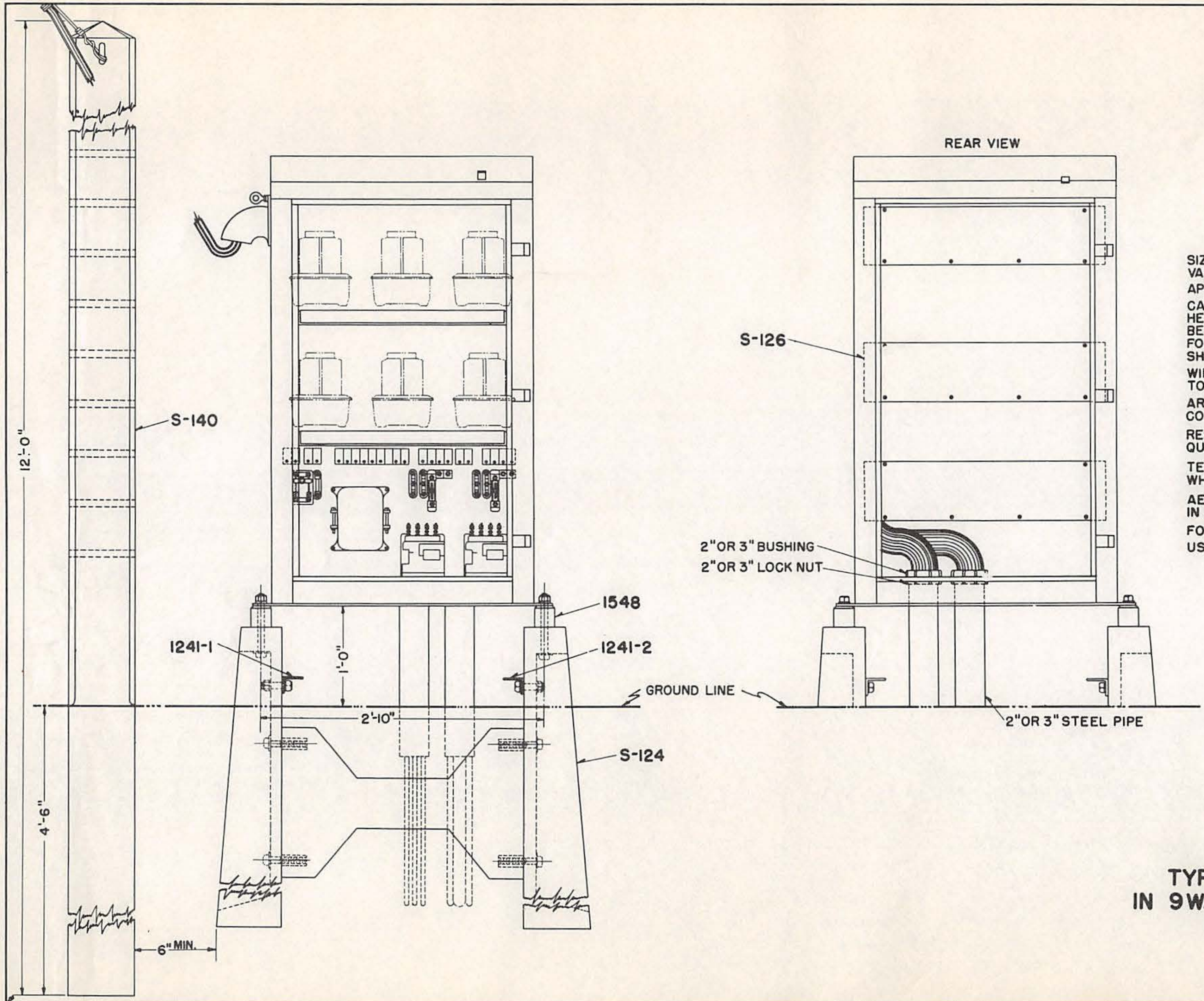
BALTIMORE & OHIO RAILROAD

ELECTRIC LAMPS
USED BY SIGNAL DEPARTMENT

OFFICE OF SIGNAL ENGINEER
BALTIMORE, MD.
MAY 19, 1958

3-21-47 Made & Corrected.
2-25-49 Items 1-2-3 & 8 revised. Items 17-18 added.
11-3-49 Plan brought up to date.
11-18-52 Revised account items 7 & 9 changed.
5-19-58 Revised account Items 1 & 2 changed.

S-113-D



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126.

RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124.

USE PLATFORM ONLY WHERE REQUIRED.

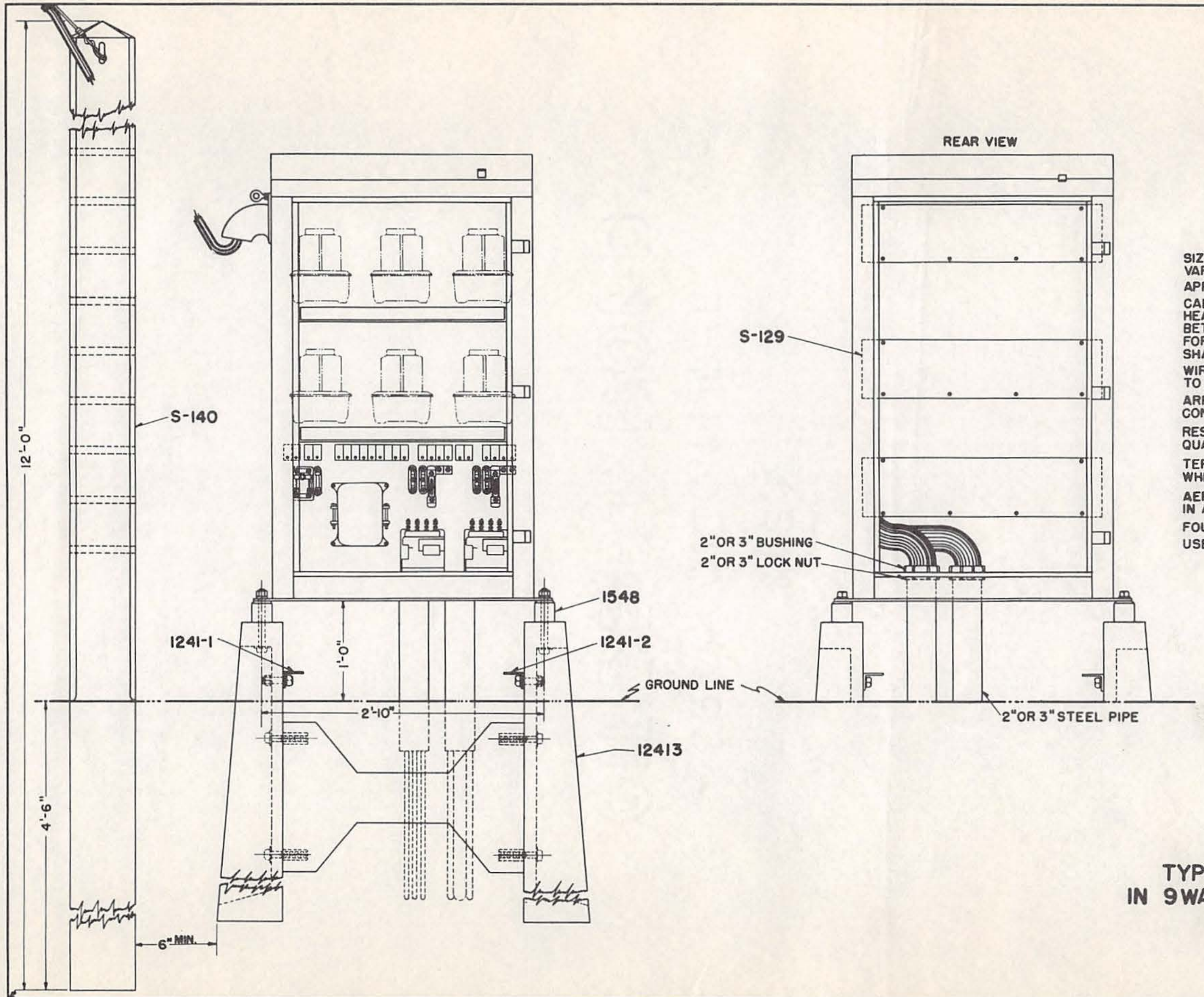
APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 9 WAY RELAY CASE G.R.S. NO. 56101-131-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 19, 1948

S-114



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126.

RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124.

USE PLATFORM ONLY WHERE REQUIRED.

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

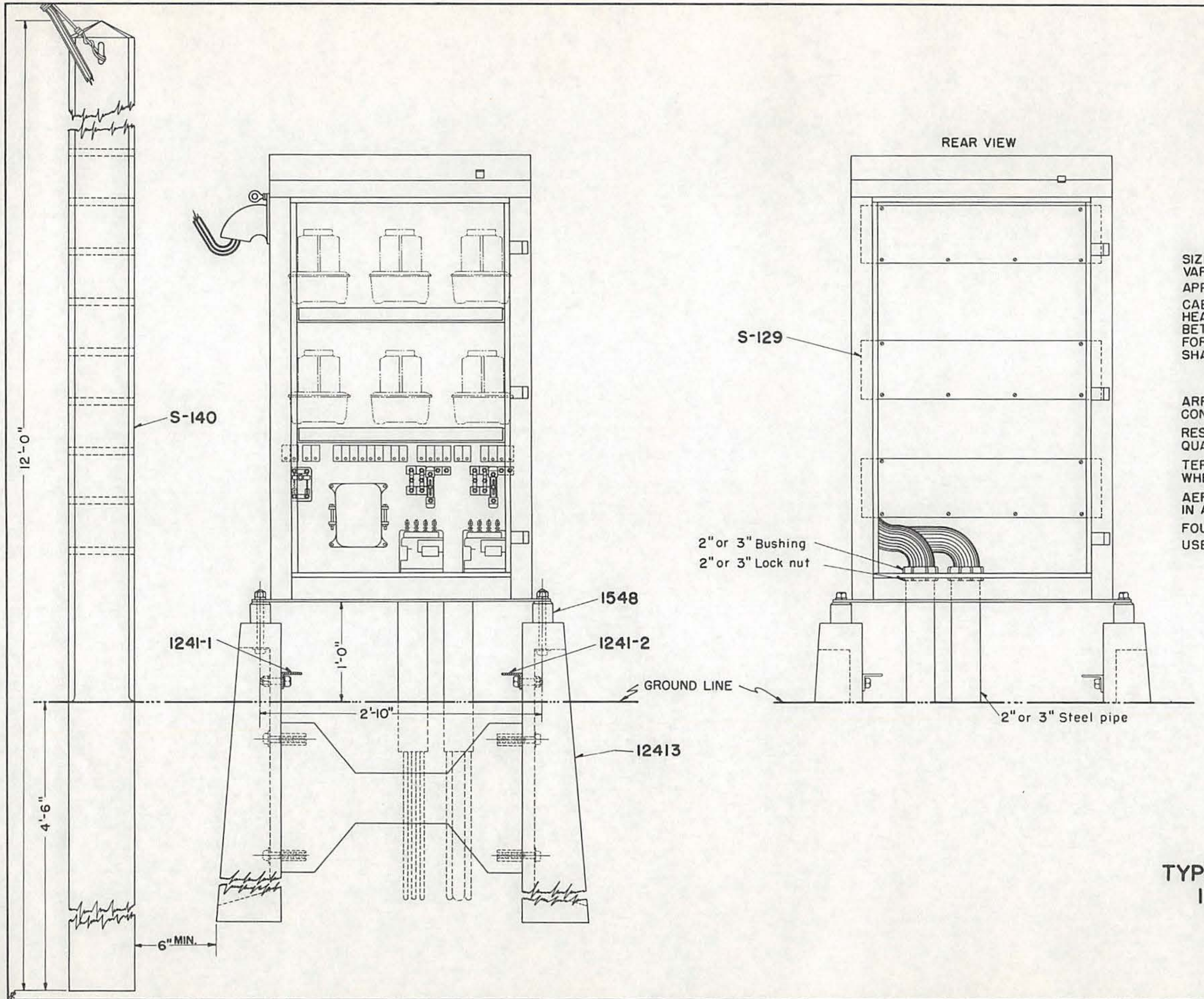
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 9 WAY RELAY CASE G.R.S. NO. 56101-131-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 19, 1948

S-114A

Adopted: 12-10-47
Revised account reference chan -50.



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126-F

RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102-A

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124-D

USE PLATFORM ONLY WHERE REQUIRED.

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 9 WAY RELAY HOUSING NO.1203

Office of Signal Engineer
Baltimore, Md.
Oct. 31, 1958

Adopted 12-10-47
Made & Corrected 3-19-48
Revised account reference changed 8-28-50.
Note removed 1-30-56.
Revised 10-31-58

S-114-C

SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126.

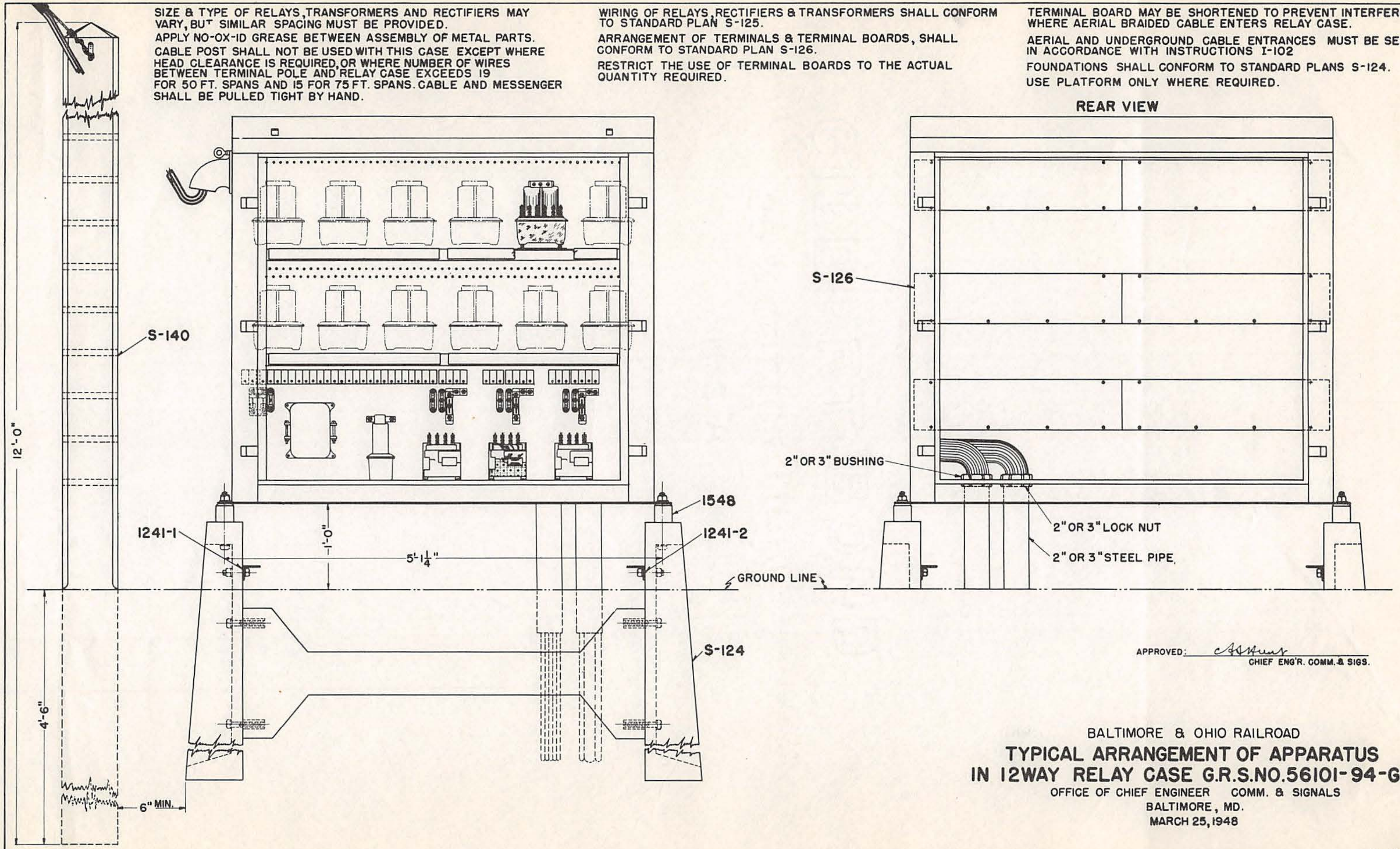
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124.

USE PLATFORM ONLY WHERE REQUIRED.



APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 12WAY RELAY CASE G.R.S.NO.56101-94-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 25, 1948

SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126.

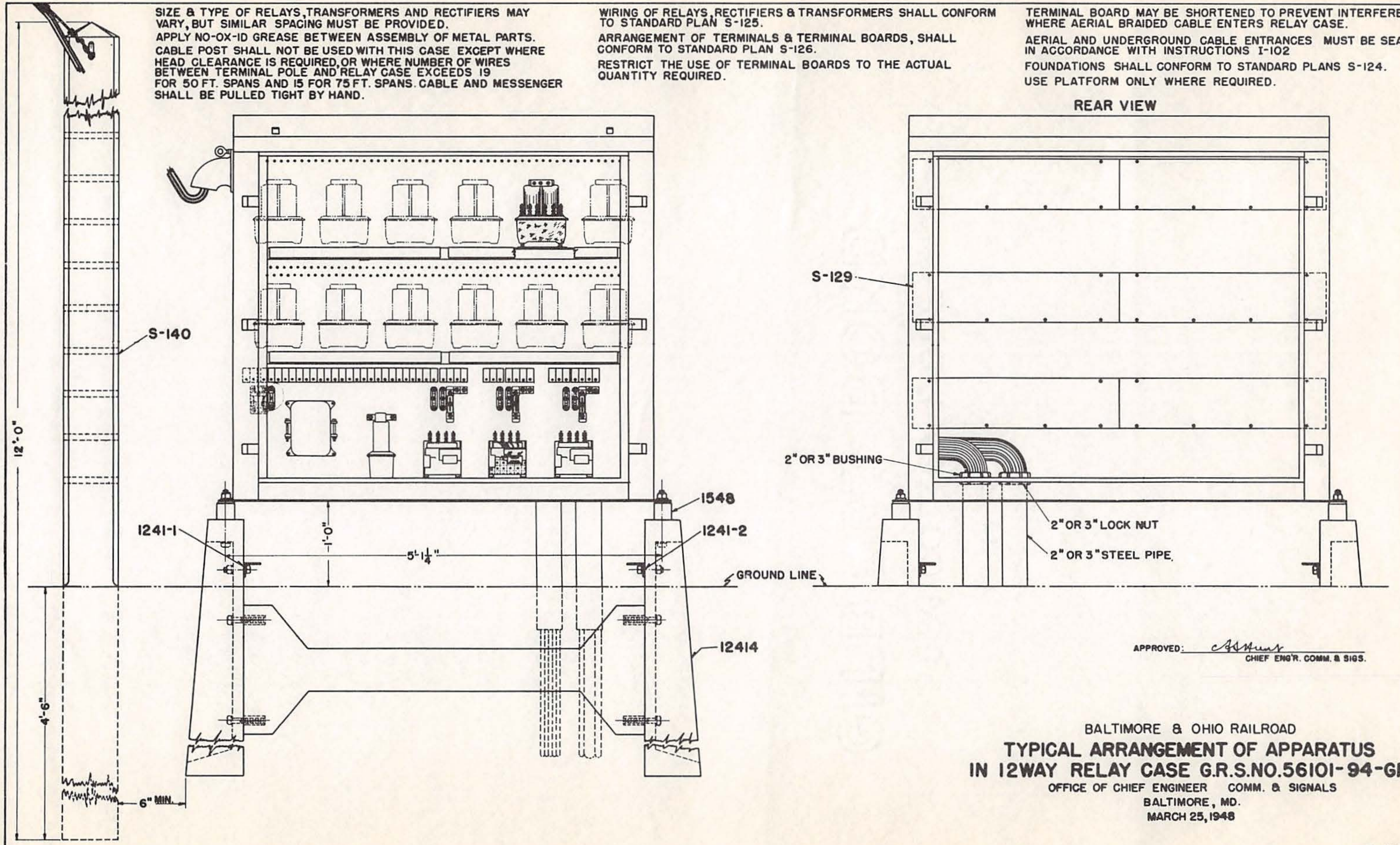
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124.

USE PLATFORM ONLY WHERE REQUIRED.



APPROVED: C.A. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 12WAY RELAY CASE G.R.S.NO.56101-94-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 25, 1948

S-115A

Adopted: 12-10-47
Revised account reference chan 8-50.

SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.

CABLE POST SHALL NOT BE USED WITH THIS CASE EXCEPT WHERE HEAD CLEARANCE IS REQUIRED, OR WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE EXCEEDS 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS, SHALL CONFORM TO STANDARD PLAN S-126-F

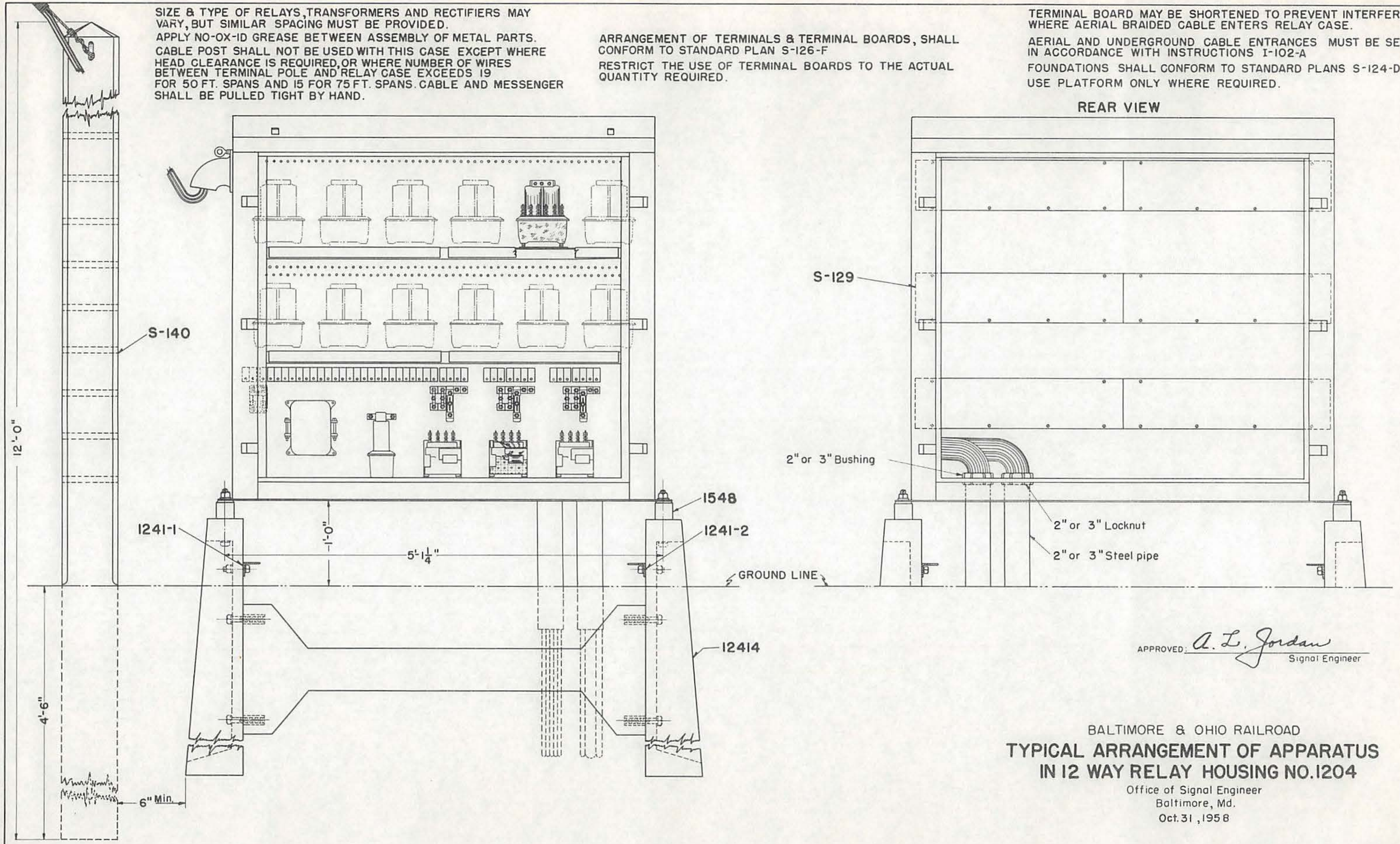
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.

TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102-A

FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124-D

USE PLATFORM ONLY WHERE REQUIRED.



APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

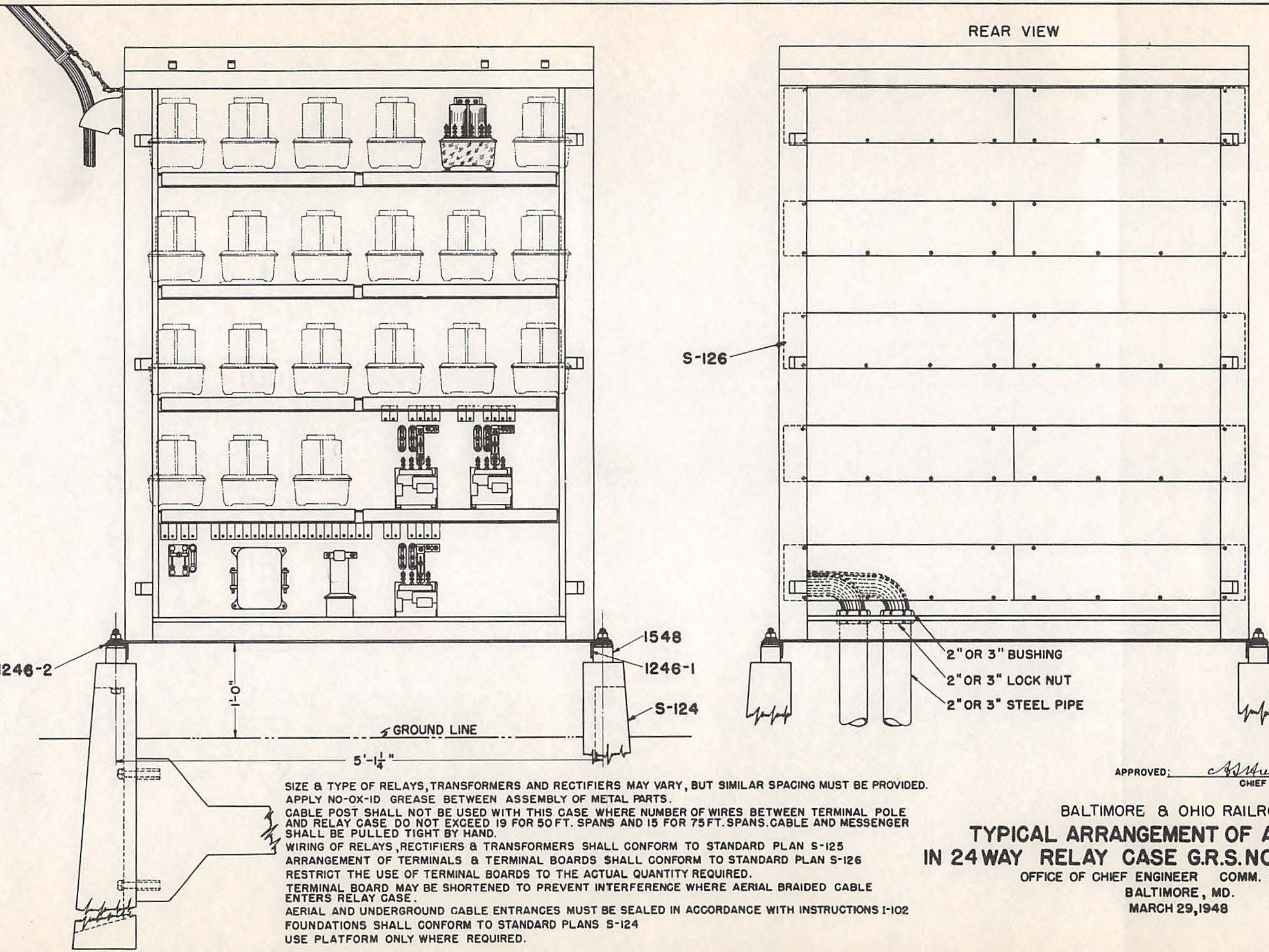
TYPICAL ARRANGEMENT OF APPARATUS IN 12 WAY RELAY HOUSING NO. 1204

Office of Signal Engineer
Baltimore, Md.
Oct. 31, 1958

Sheet No. 1

S-115-C

Adopted 12-10-47
Made & Corrected 7-24-48
Revised account reference changed 8-28-50.
Note removed 1-30-56.
Revised 10-31-58: Sheet 2 added.



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE DO NOT EXCEED 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.
WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125
ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124
USE PLATFORM ONLY WHERE REQUIRED.

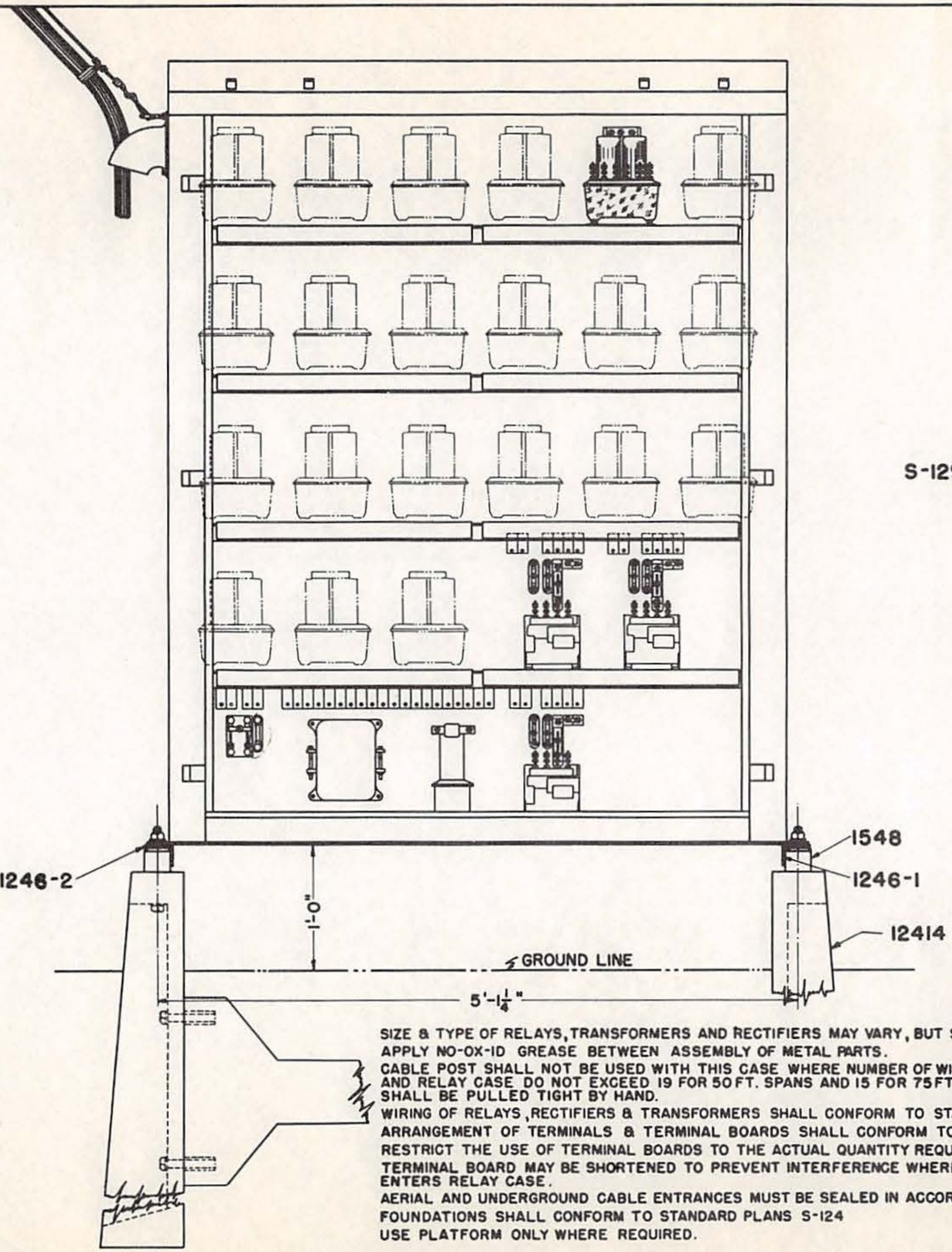
APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

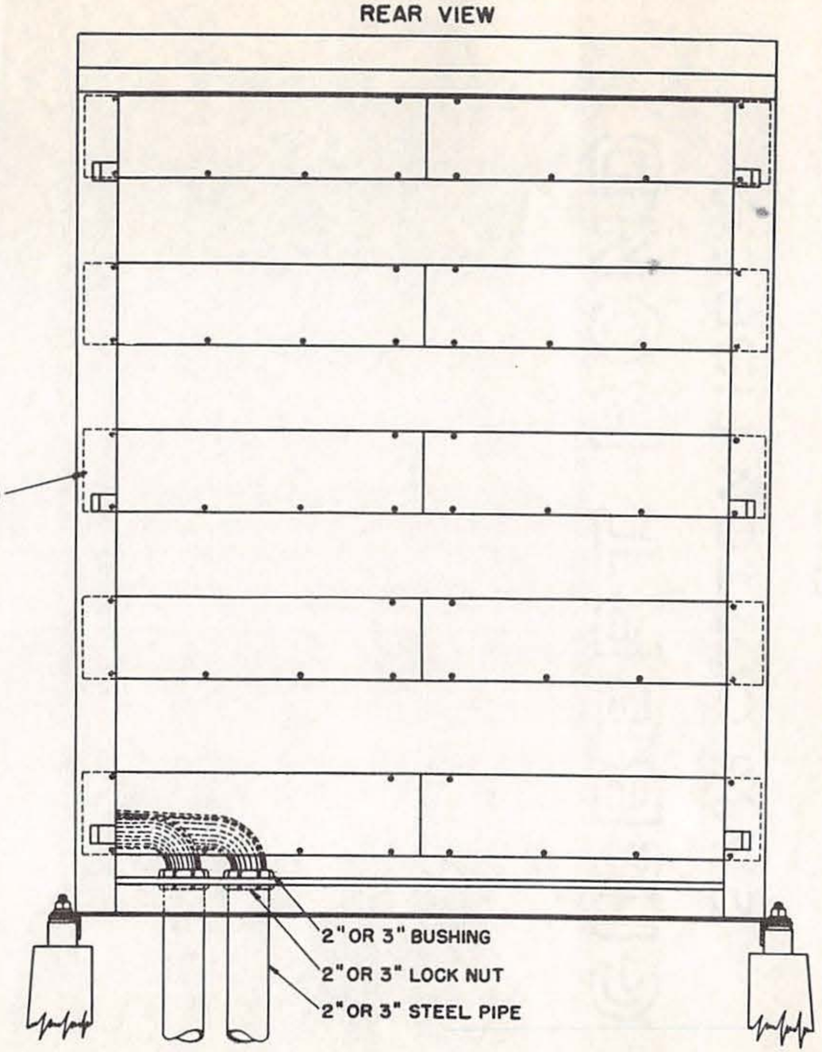
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 24 WAY RELAY CASE G.R.S. NO. 56101-95-GR. I

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 29, 1948

S-116





SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE DO NOT EXCEED 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.
WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125
ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124
USE PLATFORM ONLY WHERE REQUIRED.

APPROVED:
CHIEF ENGR. COMM. & SIGS.

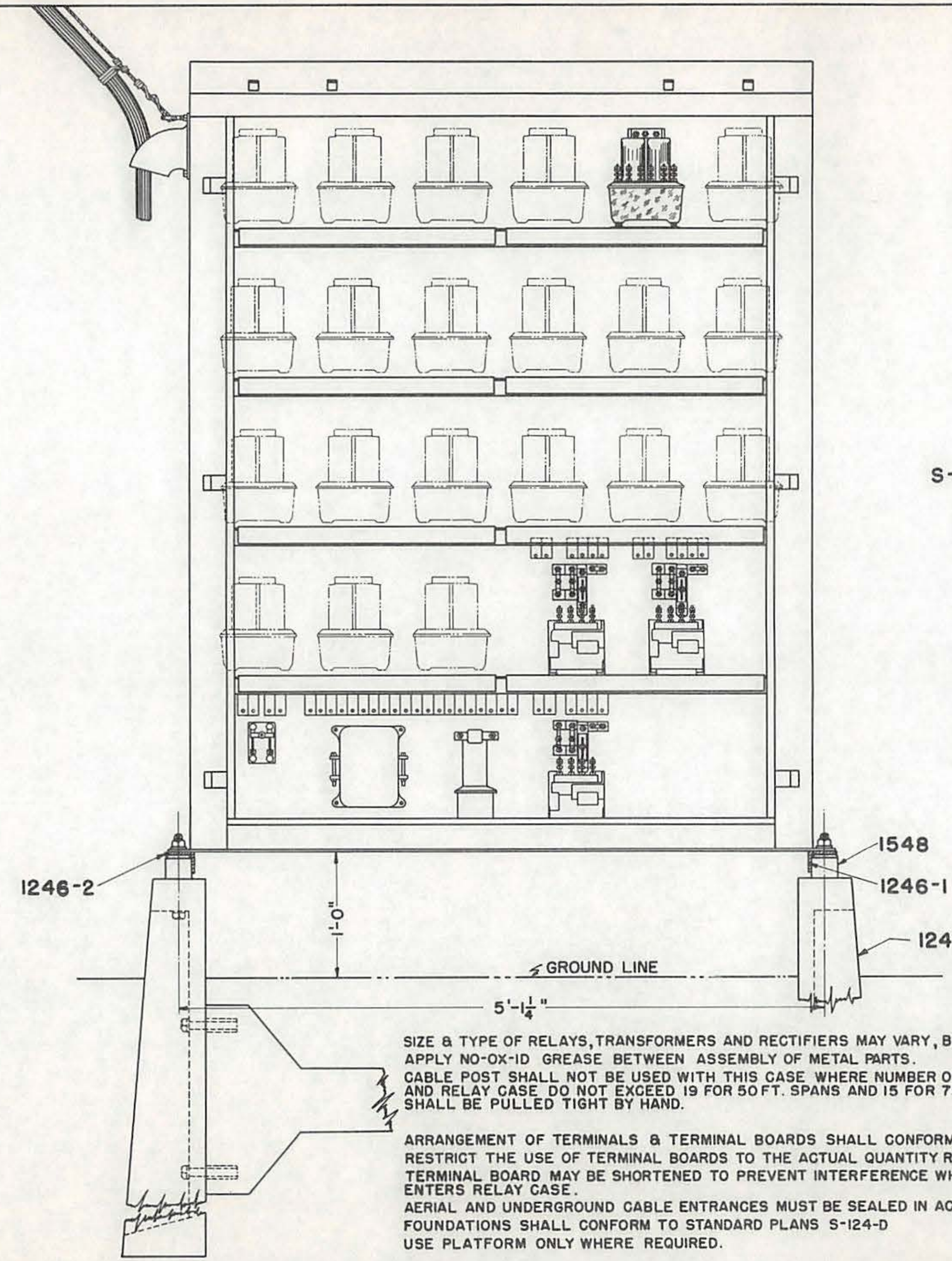
BALTIMORE & OHIO RAILROAD

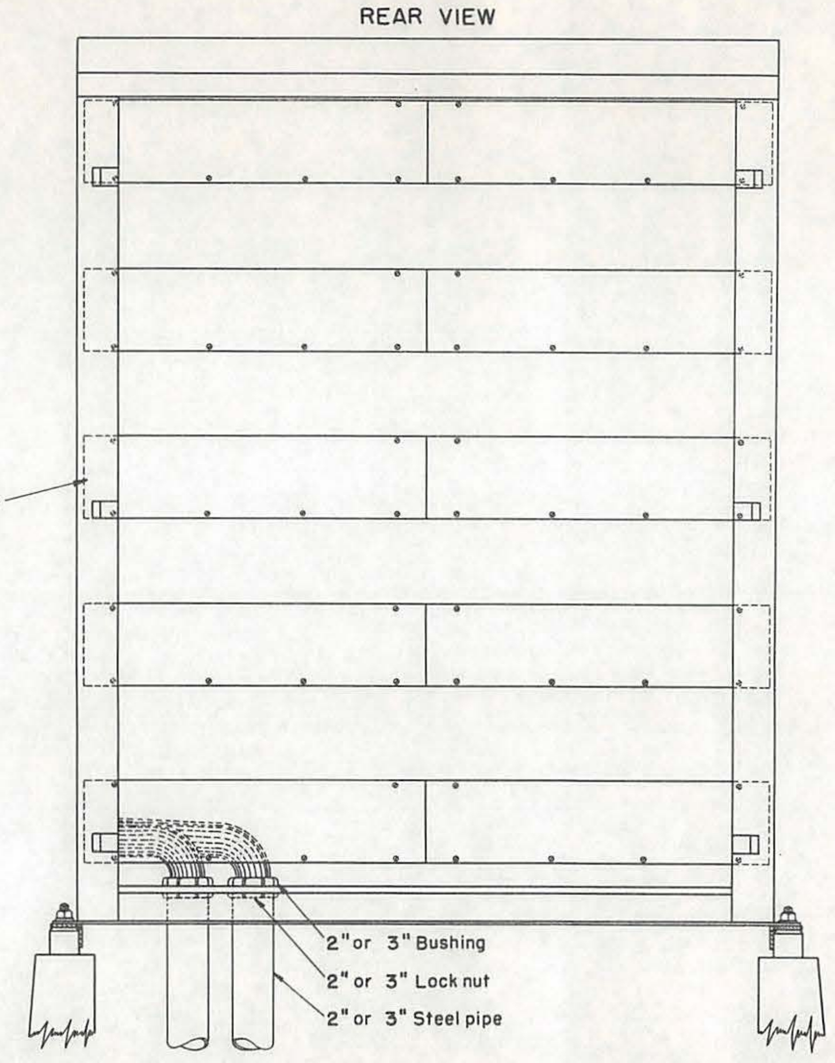
TYPICAL ARRANGEMENT OF APPARATUS IN 24 WAY RELAY CASE G.R.S. NO. 56101-95-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 29, 1948

S-116A

Adopted: 12-10-47
Revised account reference chang 28-50.





SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN ASSEMBLY OF METAL PARTS.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY CASE DO NOT EXCEED 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126-F
RESTRICT THE USE OF TERMINAL BOARDS TO THE ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102-A
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124-D
USE PLATFORM ONLY WHERE REQUIRED.

Adopted 12-10-47
Made & Corrected 3-29-48
Revised account reference changed 8-28-50.
Note removed 1-30-56.
Revised 10-31-58 : Sheet 2 added.

APPROVED: A. L. Jordan
Signal Engineer

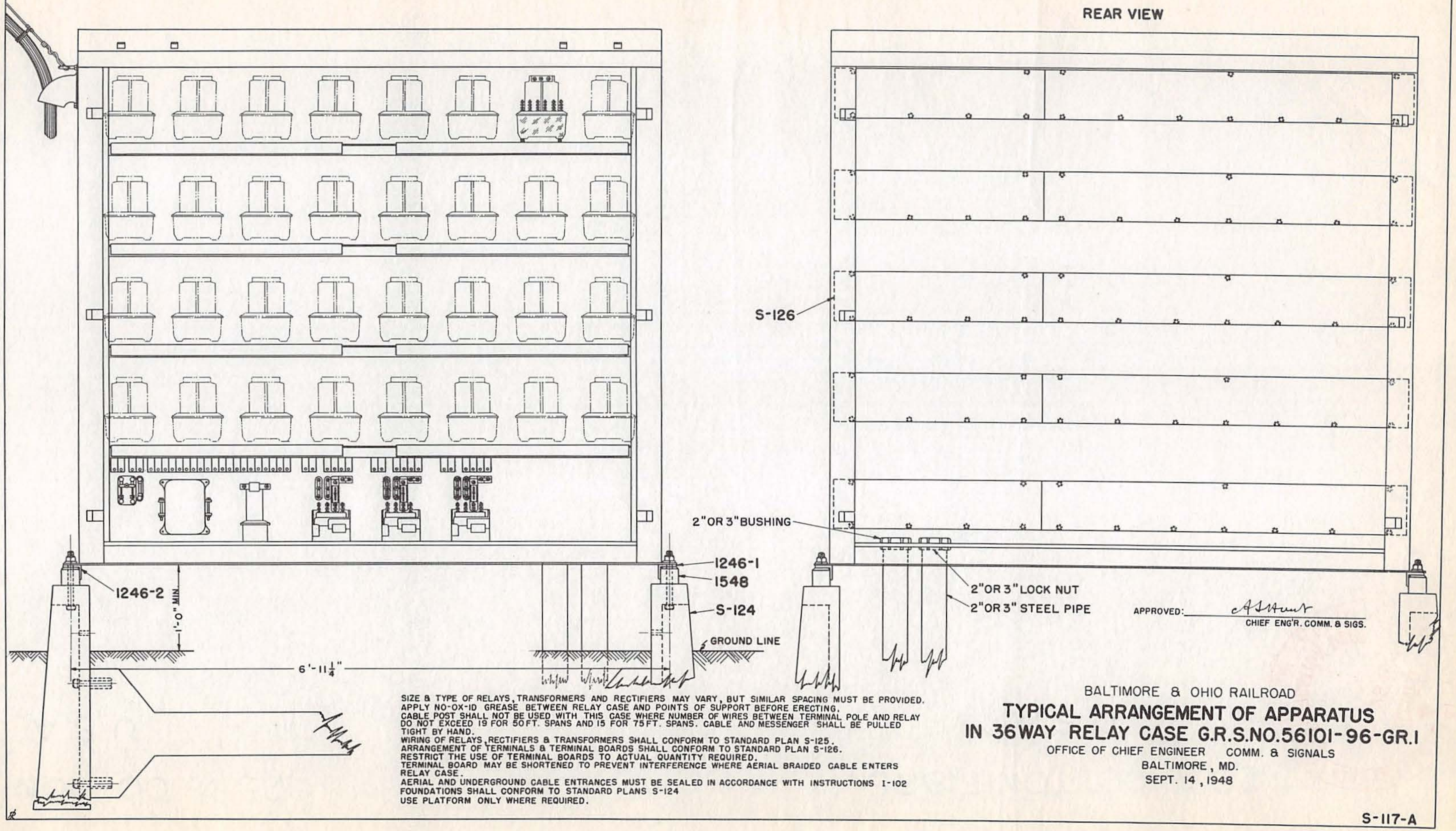
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 24 WAY RELAY HOUSING NO. 1205

Office of Signal Engineer
Baltimore, Md.
Oct. 31, 1958

Sheet No. 1

S-116-C



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN RELAY CASE AND POINTS OF SUPPORT BEFORE ERECTING.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY DO NOT EXCEED 19 FOR 50FT. SPANS AND 15 FOR 75FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.
WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.
ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126.
RESTRICT THE USE OF TERMINAL BOARDS TO ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124
USE PLATFORM ONLY WHERE REQUIRED.

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

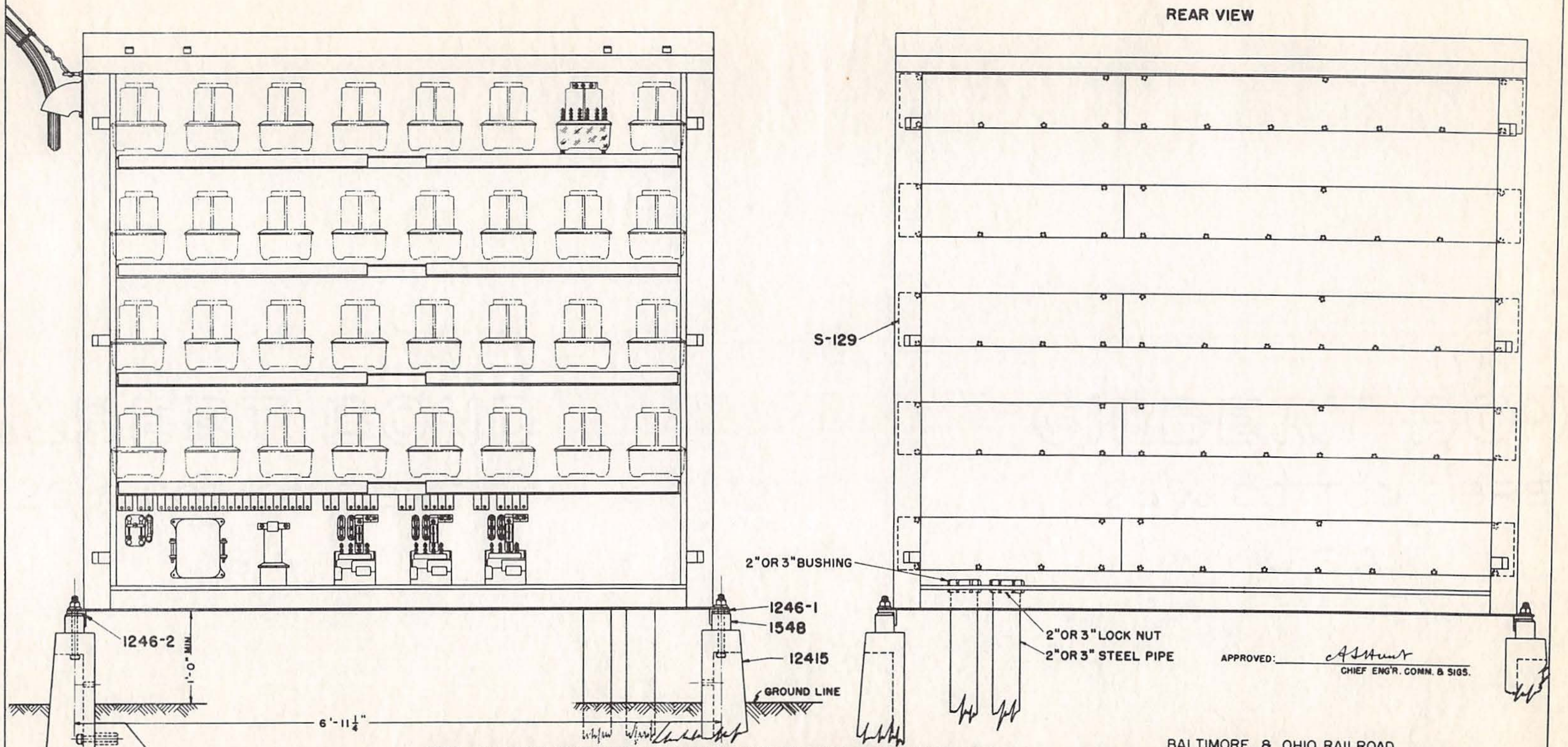
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 36WAY RELAY CASE G.R.S.NO.56101-96-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 14, 1948

ADOPTED: 12-10-47
REVISED: CAST WASHER NUMBER CORRECTED, 12-9-48.

S-117-A



APPROVED: A.H. Hunt
CHIEF ENG'R. COMM. & SIGS.

SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN RELAY CASE AND POINTS OF SUPPORT BEFORE ERECTING.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY DO NOT EXCEED 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.
WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.
ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126.
RESTRICT THE USE OF TERMINAL BOARDS TO ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124
USE PLATFORM ONLY WHERE REQUIRED.

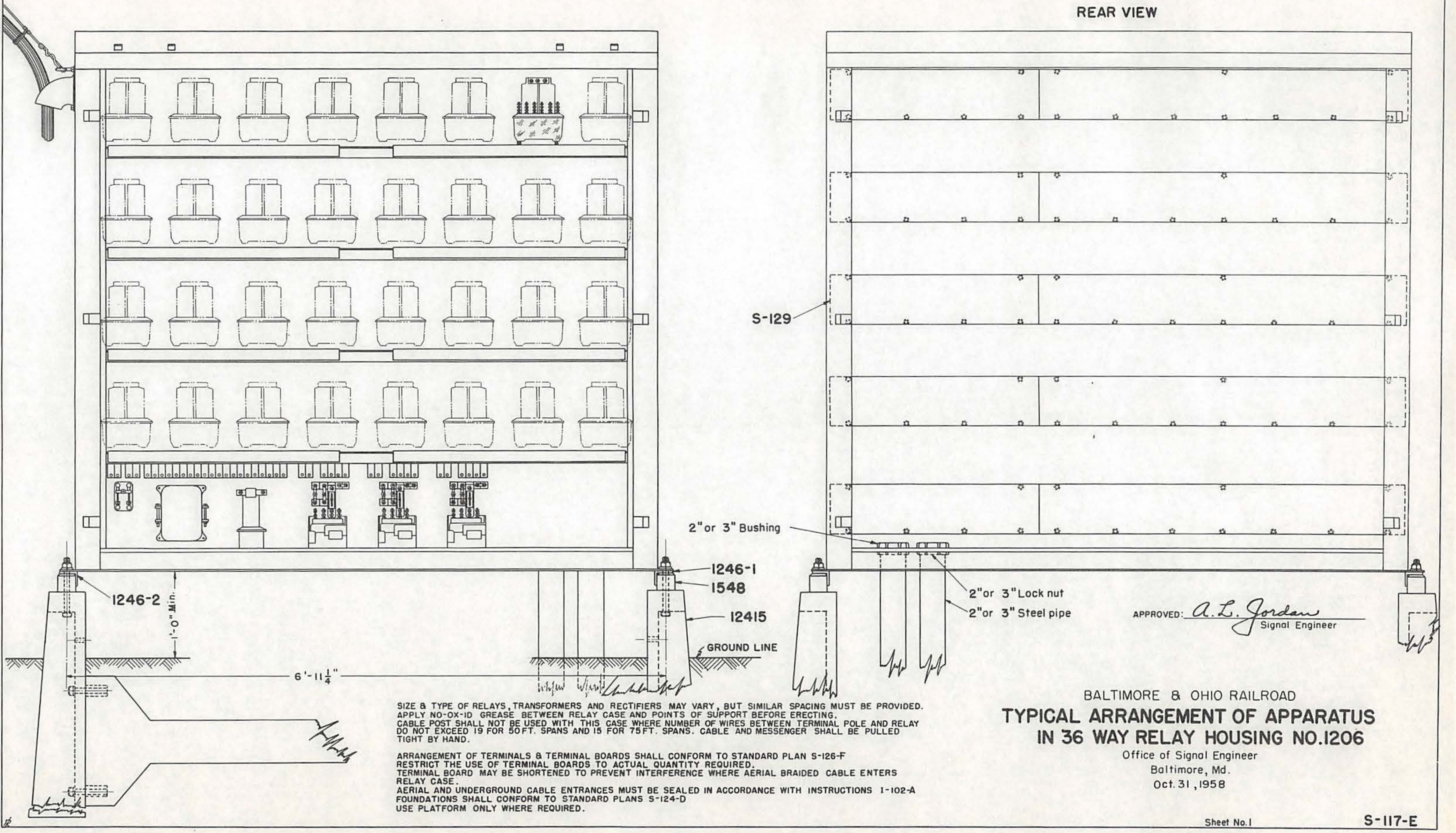
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 36WAY RELAY CASE G.R.S.NO.56101-96-GR.1

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 14, 1948

S-117-B

ADOPTED: 12-10-47
REVISED: CAST WASHER NUMB RECTED, 12-9-48.
Revised account reference change 28-50.



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.
APPLY NO-OX-ID GREASE BETWEEN RELAY CASE AND POINTS OF SUPPORT BEFORE ERECTING.
CABLE POST SHALL NOT BE USED WITH THIS CASE WHERE NUMBER OF WIRES BETWEEN TERMINAL POLE AND RELAY DO NOT EXCEED 19 FOR 50 FT. SPANS AND 15 FOR 75 FT. SPANS. CABLE AND MESSENGER SHALL BE PULLED TIGHT BY HAND.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126-F
RESTRICT THE USE OF TERMINAL BOARDS TO ACTUAL QUANTITY REQUIRED.
TERMINAL BOARD MAY BE SHORTENED TO PREVENT INTERFERENCE WHERE AERIAL BRAIDED CABLE ENTERS RELAY CASE.
AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102-A
FOUNDATIONS SHALL CONFORM TO STANDARD PLANS S-124-D
USE PLATFORM ONLY WHERE REQUIRED.

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

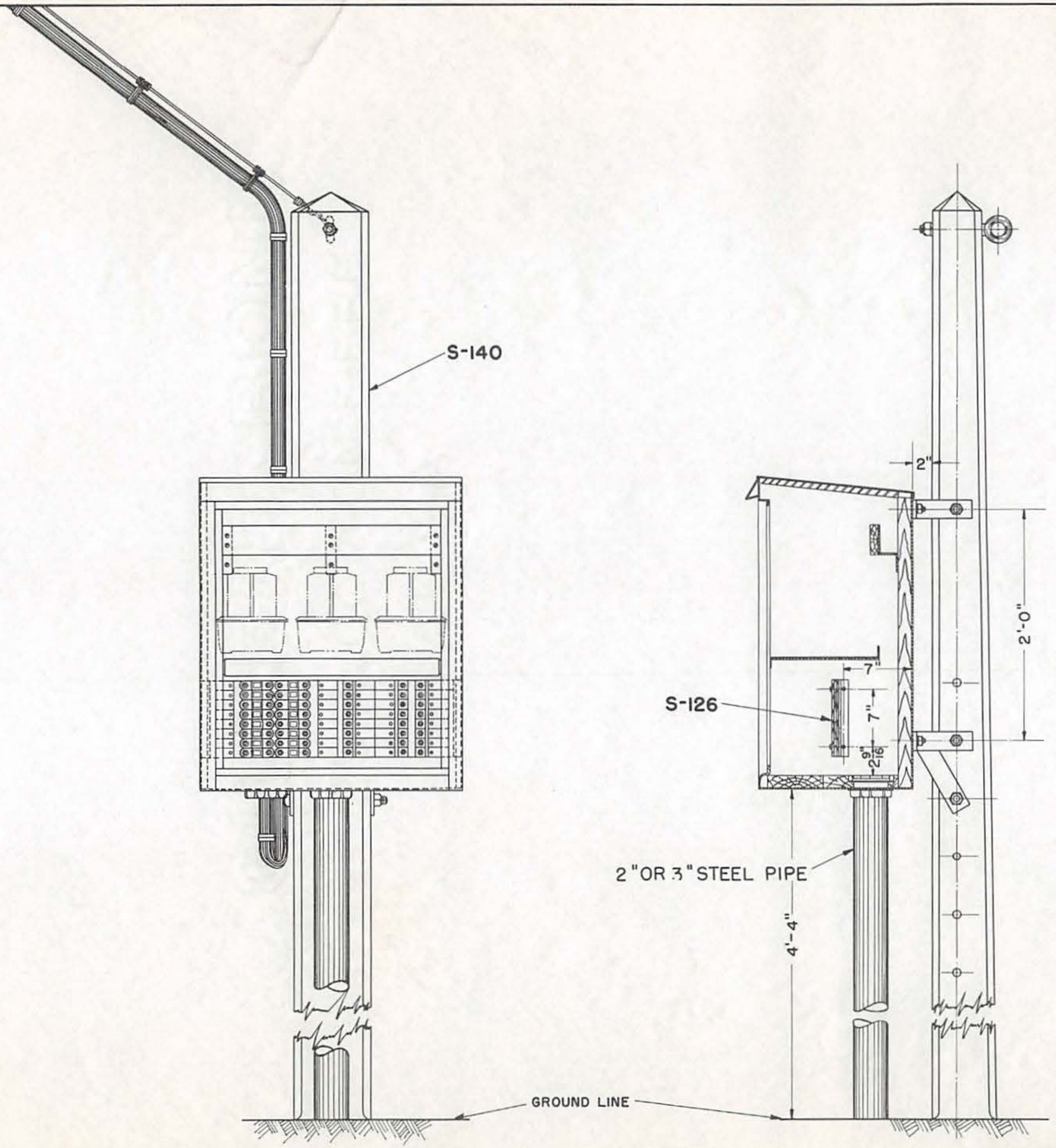
TYPICAL ARRANGEMENT OF APPARATUS IN 36 WAY RELAY HOUSING NO.1206

Office of Signal Engineer
Baltimore, Md.
Oct. 31, 1958

Sheet No. 1

S-117-E

Adopted: 12-10-47
Made & Corrected 9-14-48.
Revised 12-9-48: Cast washer number corrected.
Revised 8-28-50: Reference changed.
Note removed 1-30-56.
Revised 7-16-58.
Revised 10-31-58: Sheet 2 Added.



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN RELAY CASE AND POINTS OF SUPPORT BEFORE ERECTING.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126.

AERIAL & UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102

TERMINALS & LIGHTNING ARRESTERS SHALL BE LIMITED TO ACTUAL QUANTITY REQUIRED.

CABLE & MESSENGER SHALL BE PULLED TIGHT BY HAND.

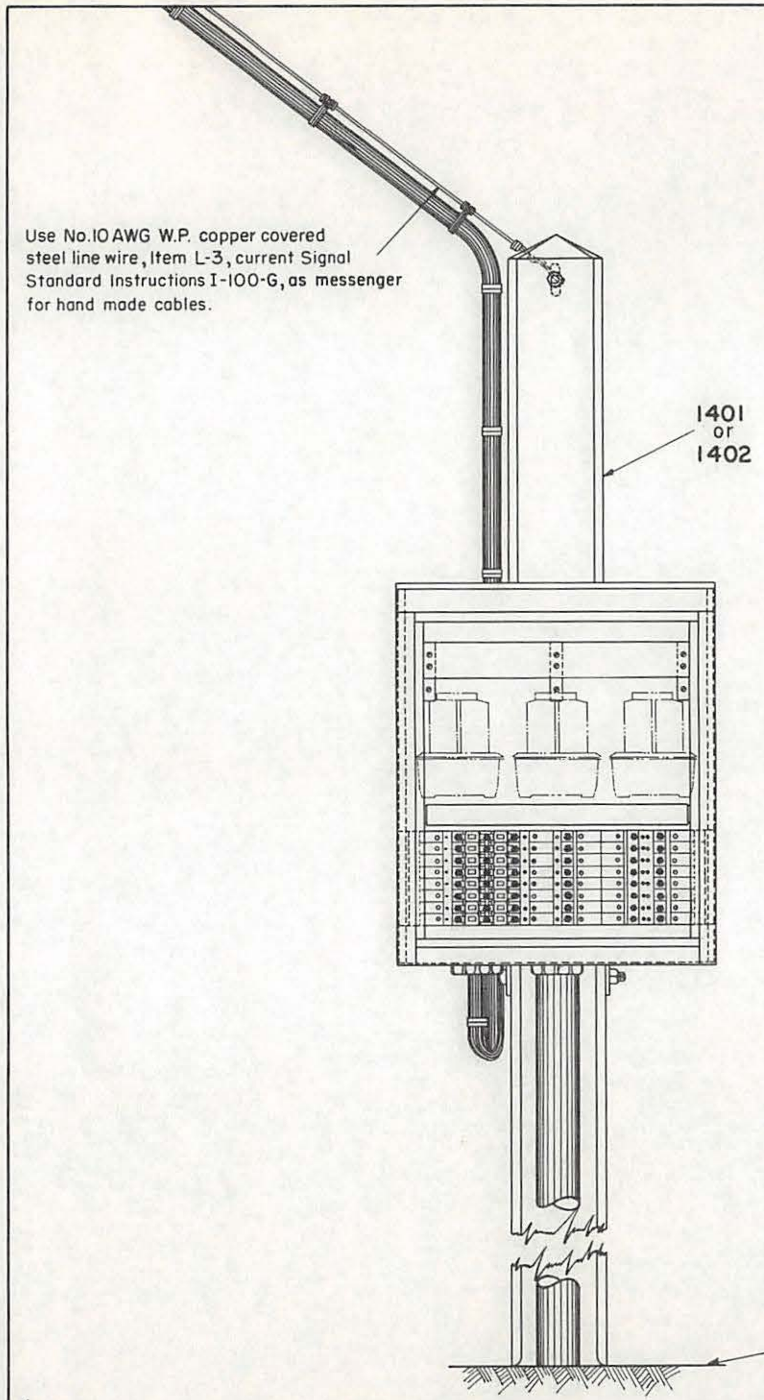
APPROVED: c A S Hay
CHIEF ENG'R. COMM. & SIGS.

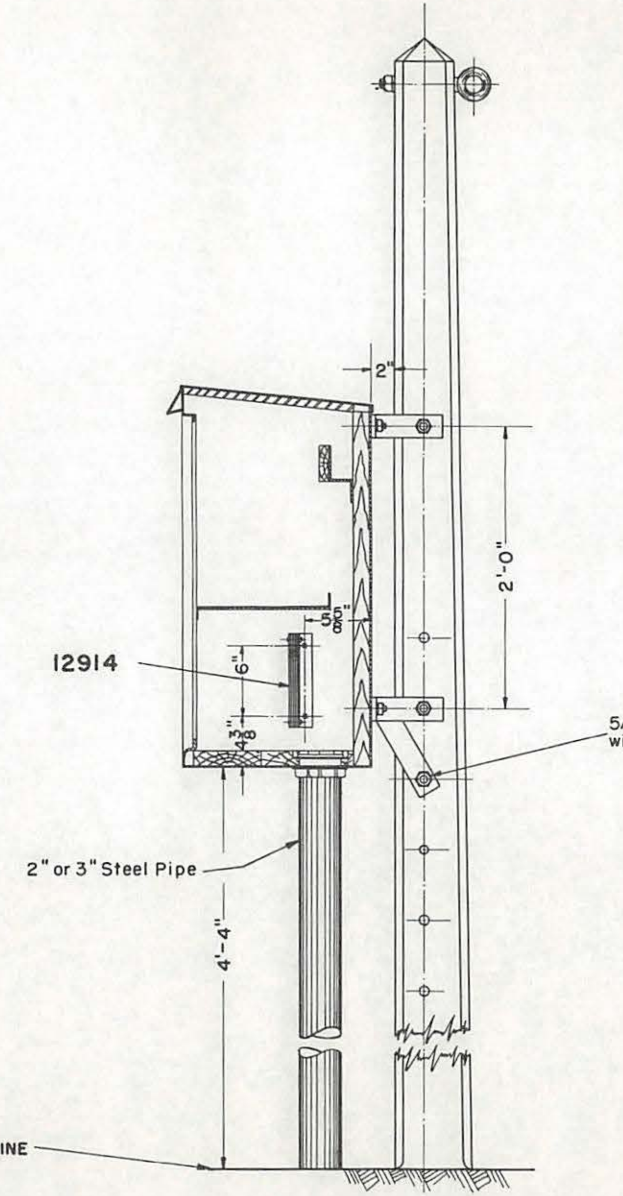
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 3 WAY RELAY CASE G.R.S.NO.54311-97-GR.I

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 15, 1948

S-119


Use No.10 AWG W.P. copper covered steel line wire, Item L-3, current Signal Standard Instructions I-100-G, as messenger for hand made cables.
1401 or 1402
GROUND LINE


2"
2'-0"
12914
6"
5/8"
4 3/8"
2" or 3" Steel Pipe
4'-4"
5/8"-11x9-1/2" Galv.Sq.Hd.Mach.Bolt with Hex.Nut & Spring Washer.

Size and type of relays, transformers and rectifiers may vary, but similar spacing must be provided.

Apply NO-OX-ID "A" Special grease (Item 17, I-135-A) between relay housing and points of support before erecting.

Arrangement of terminals and terminal boards shall conform to Standard Plan S-126-F.

Aerial and underground cable entrances must be sealed in accordance with current Instructions I-102-A.

APPROVED: A. L. Jordan
Signal Engineer

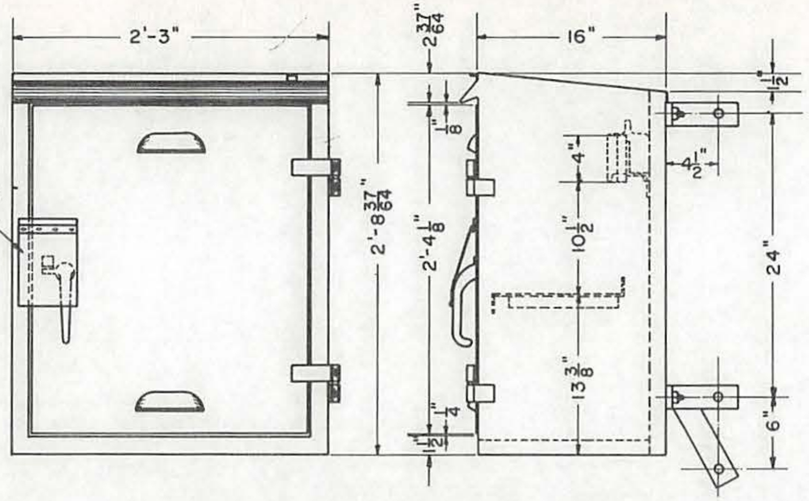
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 3 WAY RELAY HOUSING NO. 1201

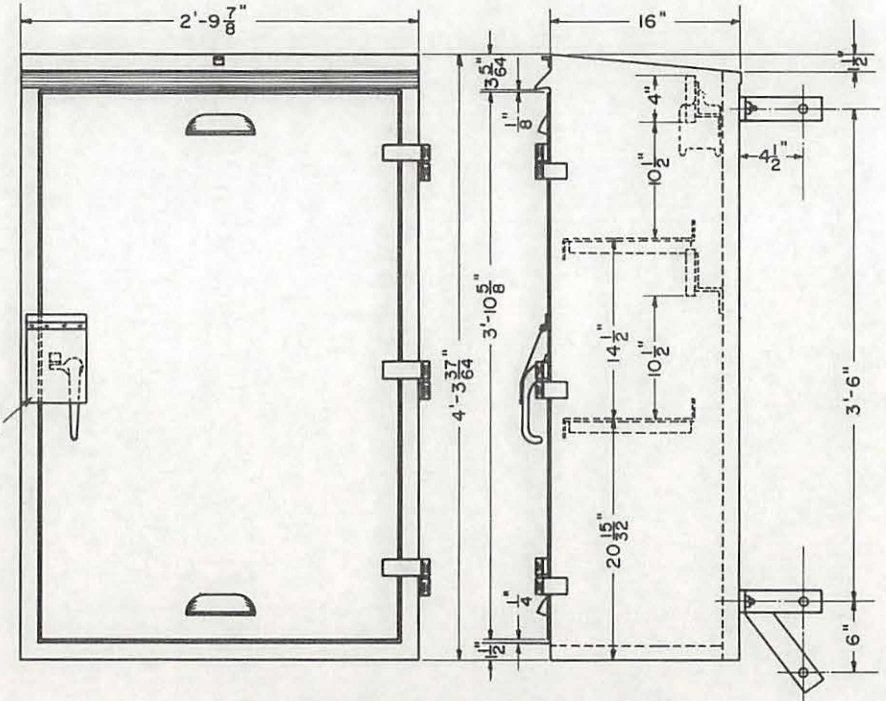
Office of Signal Engineer
Baltimore, Md.
Sept. 8, 1958

S-119-C

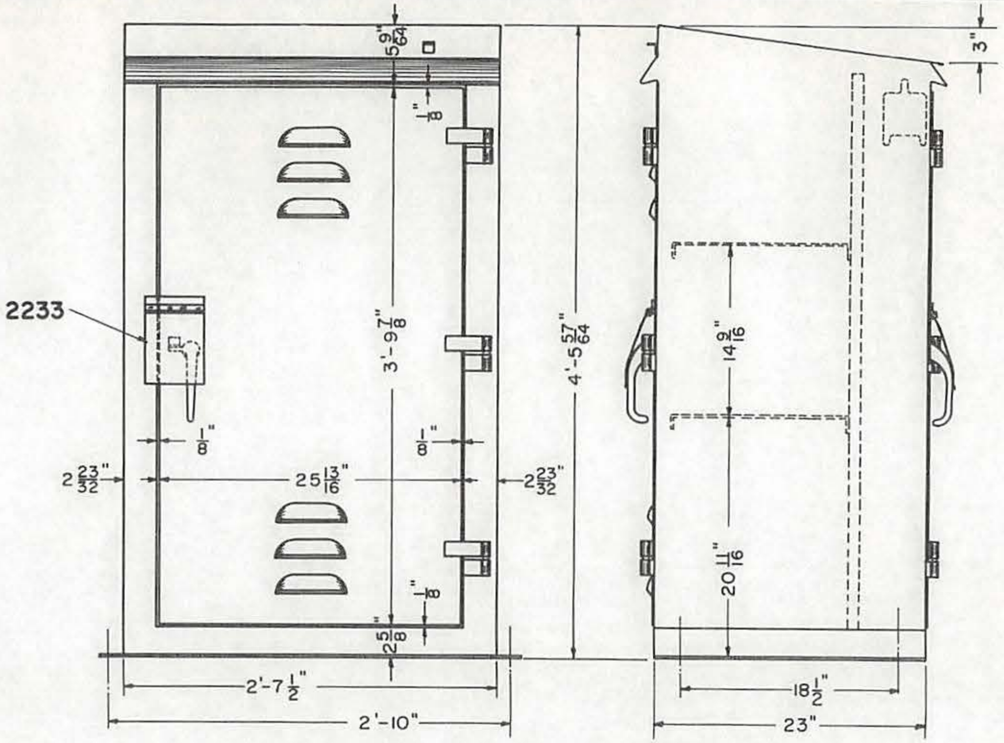
Plan dated: Sept. 15, 1948.
1-16-53: Revised account relocating Terminal Board.
Note removed 1-30-56.
Revised: Sept. 8, 1958.


2'-3"
2233
$2\frac{37}{64}$"
16"
$2'-8\frac{37}{64}$"
$2'-4\frac{1}{8}$"
$\frac{1}{8}$"
4"
$10\frac{1}{2}$"
$13\frac{3}{8}$"
$\frac{1}{4}$"
$\frac{1}{2}$"
$1\frac{1}{2}$"
$4\frac{1}{2}$"
24"
6"

3-WAY SHEET METAL RELAY HOUSING – 1201


$2'-9\frac{7}{8}$"
16"
$3\frac{5}{64}$"
$\frac{1}{8}$"
4"
$10\frac{1}{2}$"
$4\frac{1}{2}$"
$1\frac{1}{2}$"
$3'-10\frac{5}{8}$"
$4'-3\frac{37}{64}$"
$14\frac{1}{2}$"
$10\frac{1}{2}$"
$20\frac{15}{32}$"
$\frac{1}{4}$"
$\frac{1}{2}$"
3'-6"
6"
2233

6-WAY SHEET METAL RELAY HOUSING – 1202


$5\frac{9}{64}$"
3"
$\frac{1}{8}$"
2233
$3'-9\frac{7}{8}$"
$4'-5\frac{57}{64}$"
$14\frac{9}{16}$"
$\frac{1}{8}$"
$8\frac{1}{8}$"
$2\frac{23}{32}$"
$25\frac{13}{16}$"
$2\frac{23}{32}$"
$20\frac{11}{16}$"
$\frac{1}{8}$"
$2\frac{5}{8}$"
$2'-7\frac{1}{2}$"
2'-10"
$18\frac{1}{2}$"
23"

9-WAY SHEET METAL RELAY HOUSING – 1203

Hooks & Eyebolts shall be installed to allow door to remain open in 90° position.
Rear View of Relay Housing No.1203 similar to Front View except louvers are omitted.
Housings shall be provided with Aerial Cable Knockouts on both sides. See Dwg. S-223-A and specify size and number of couplings required.
Housings shall be painted in accordance with current Instructions I-134-C.
Housings shall be constructed of corrosive resistant steel.
All relay cases shown shall be Celotex lined.
Backboards shall be 3/4" plywood.
Shelves to be steel and covered with 1/8" ribbed Rubber matting.
3-Point type of Latch shall be used.
Conduit, bushings, and Locknuts to be furnished by railroad.

Approved: A L Jordan
Signal Engineer

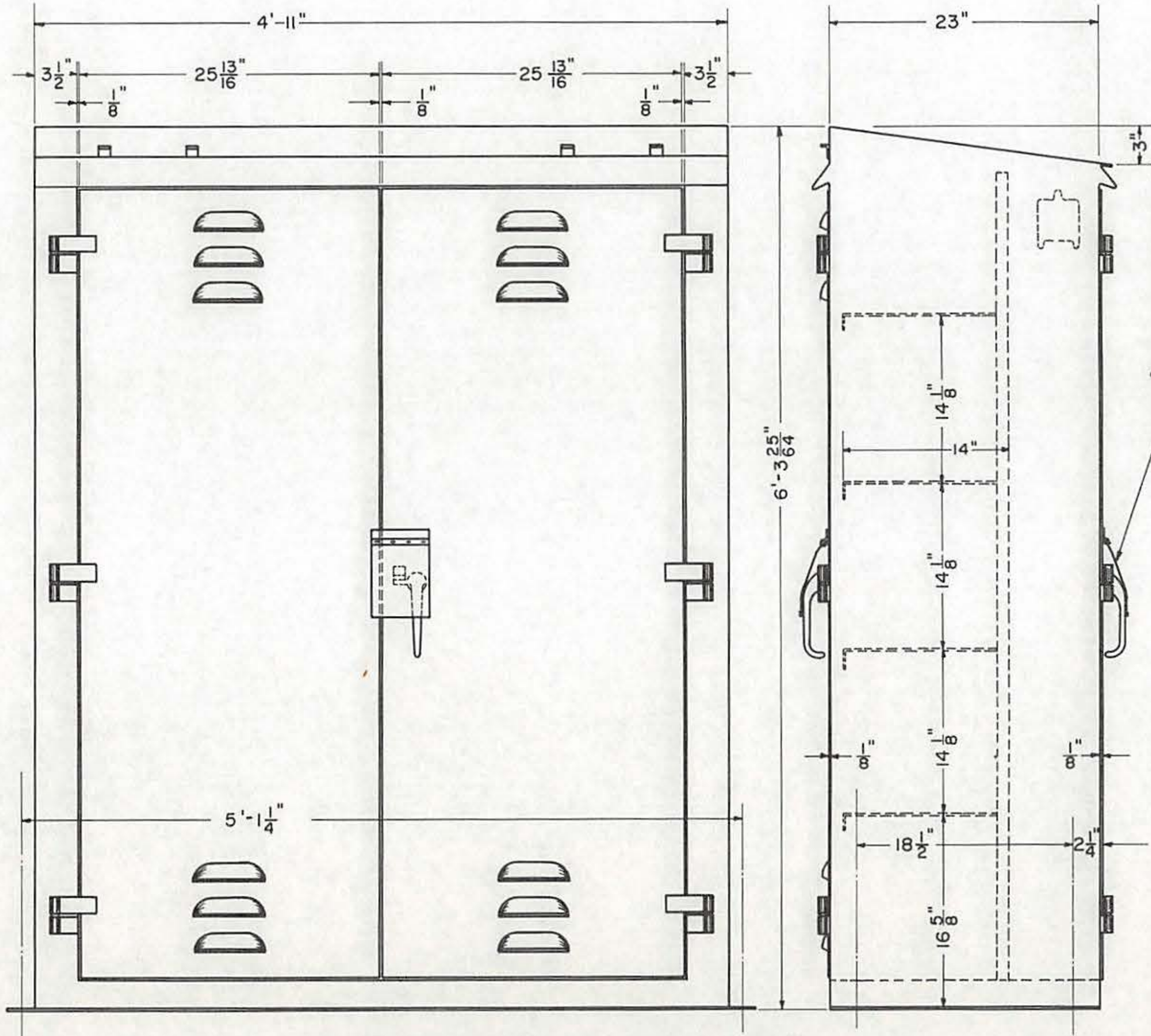
BALTIMORE & OHIO RAILROAD
SHEET METAL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
Sept. 2, 1958.

Plan dated: July 18, 1950.–Adopted: May 15, 1951.
Revised: Sept. 2, 1958.

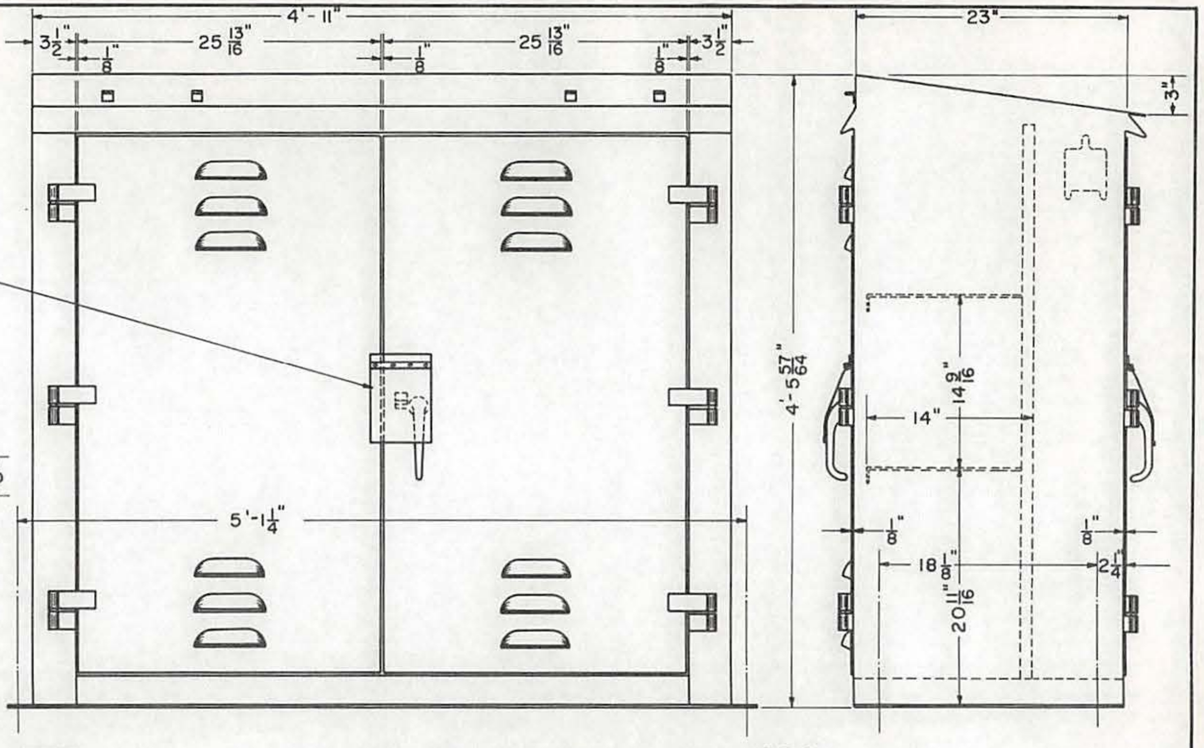
Sheet No. 1

S-120-A

Plan dated: July 16, 1950.- Adopted May 15, 1951.
Revised: Sept. 2, 1958.


4'-11"
3½"
25 13/16"
1/8"
25 13/16"
1/8"
1/8"
3½"
23"
3"
6'-3 25/64"
14 1/8"
14"
14 1/8"
14 1/8"
1/8"
1/8"
5'-1¼"
18½"
2¼"
16 5/8"
2233

24-WAY SHEET METAL RELAY HOUSING - 1205


2233
4'-11"
3½"
1/8"
25 13/16"
1/8"
25 13/16"
1/8"
3½"
23"
3"
4'-5 57/64"
14 9/16"
14"
5'-1¼"
1/8"
1/8"
18 1/8"
2¼"
20 11/16"

12-WAY SHEET METAL RELAY HOUSING - 1204

NOTES:

Hooks & Eyebolts shall be installed to allow door to remain open in 90° and 160° positions.

Rear View of Relay Housing similar to Front View except louvers are omitted.

Housings shall be provided with Aerial Cable Knockouts on both sides. See Dwg. S-223-A and specify size and number of couplings required.

Housings shall be painted in accordance with current Instructions I-134-C.

Housings shall be constructed of corrosive resistant steel.

Backboards shall be 3/4" plywood.

All relay cases shown shall be Celotex lined.

Shelves to be steel and covered with 1/8" ribbed Rubber matting.

3-Point type of Latch shall be used.

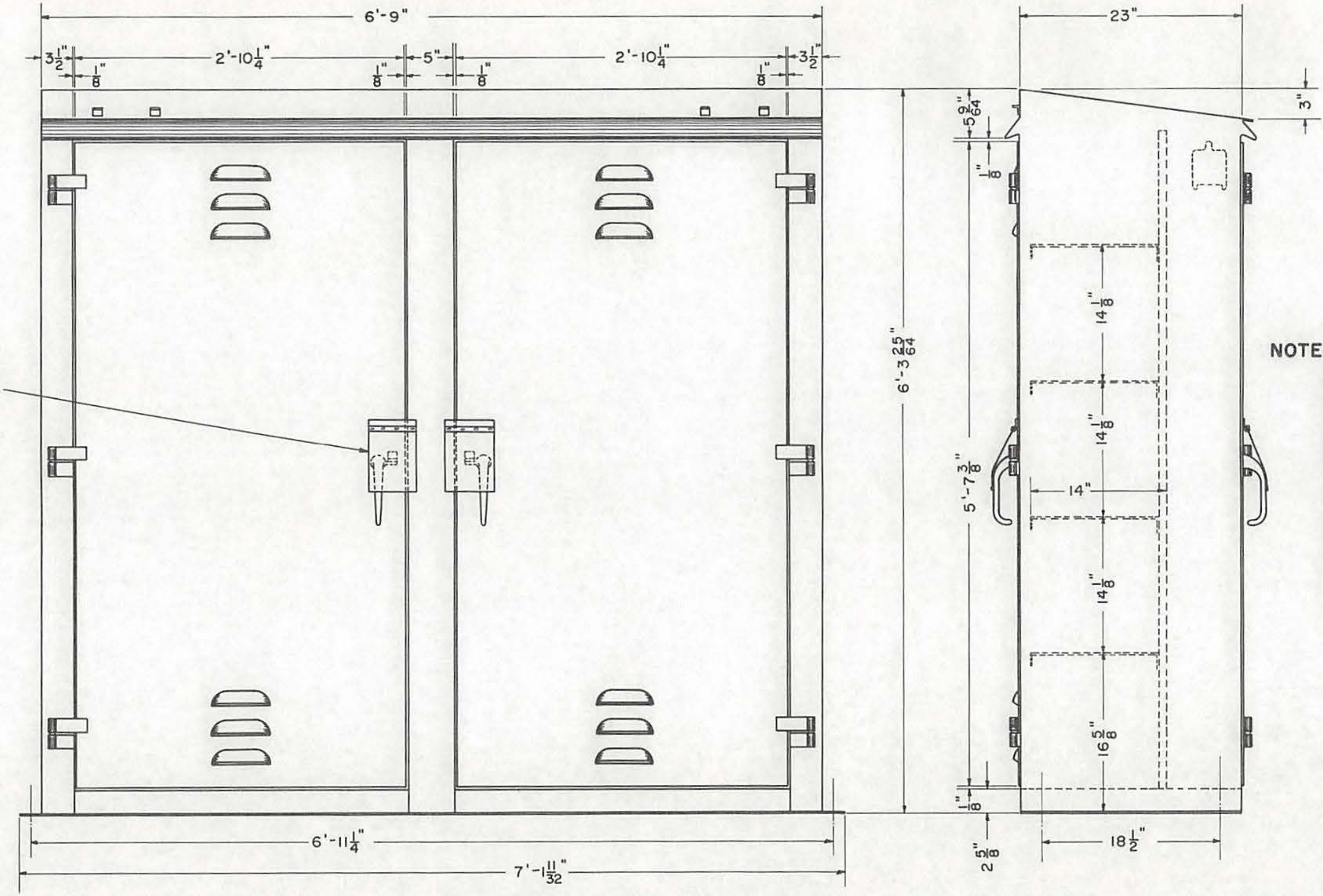
Conduit, bushings, and Locknuts to be furnished by railroad.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SHEET METAL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
Sept. 2, 1958

Sheet No. 2

S-120-A



36-WAY SHEET METAL RELAY HOUSING - 1206

NOTES:

Hooks & Eyebolts shall be installed to allow door to remain open in 90° and 160° positions.

Rear View of Relay Housing similar to Front View except louvers are omitted.

Housing shall be provided with Aerial Cable Knockouts on both sides. See Dwg. S-223-A and specify size and number of couplings required.

Housing shall be painted in accordance with current Instructions I-134-A.

Housing shall be constructed of corrosive resistant steel.

All relay cases shown shall be Celotex lined.

Backboards shall be 3/4" plywood.

Shelves to be steel and covered with 1/8" ribbed Rubber matting.

3-Point type of Latch shall be used.

Conduit, bushings, and Locknuts to be furnished by railroad.

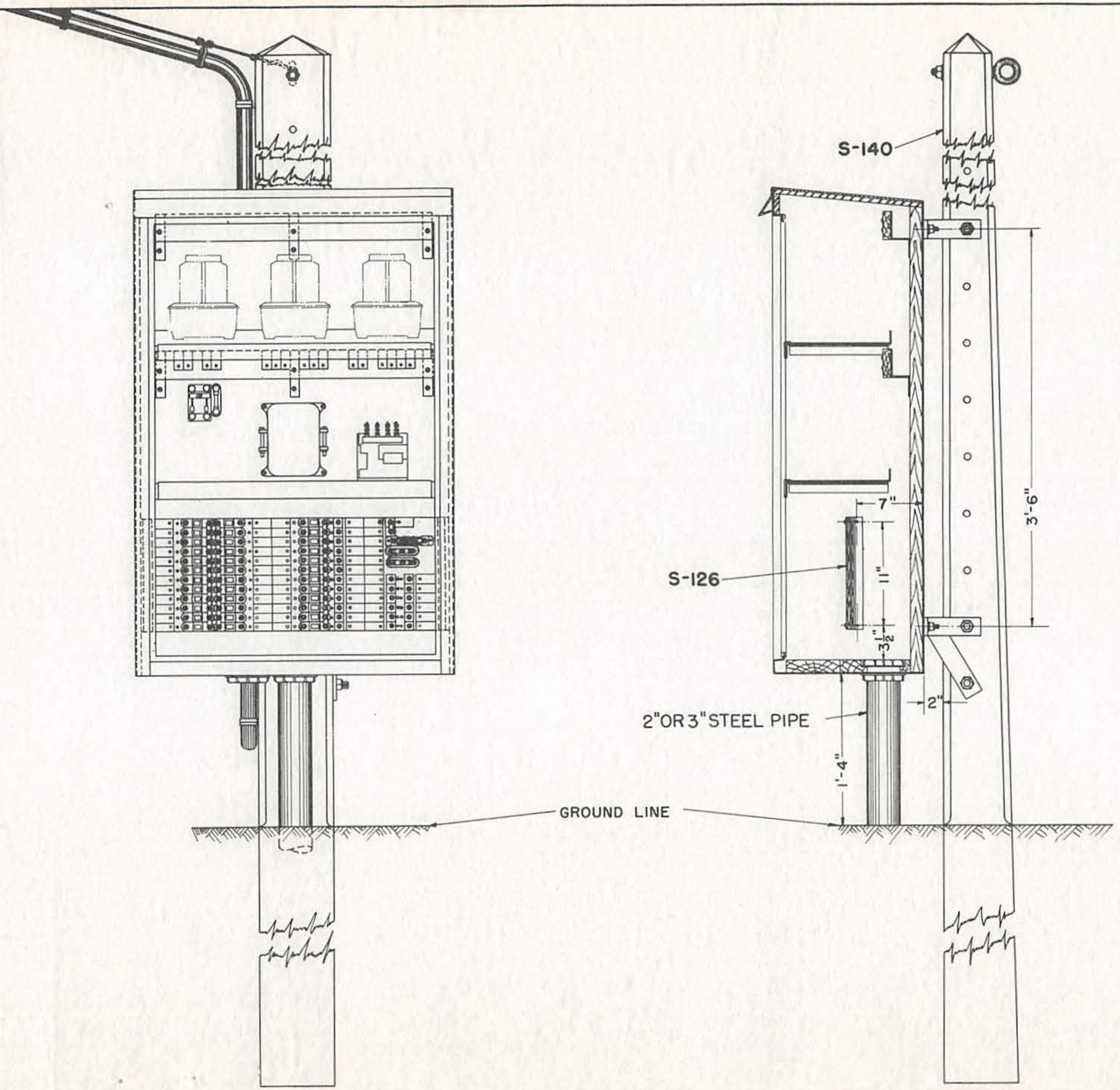
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SHEET METAL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
Sept. 2, 1958

Plan dated: July 18, 1950 – Adopted: May 15, 1951.
Revised: Sept. 2, 1958.

Sheet No. 3

S-120-A



SIZE & TYPE OF RELAYS, TRANSFORMERS AND RECTIFIERS MAY VARY, BUT SIMILAR SPACING MUST BE PROVIDED.

APPLY NO-OX-ID GREASE BETWEEN RELAY CASE AND POINTS OF SUPPORT BEFORE ERECTING.

WIRING OF RELAYS, RECTIFIERS & TRANSFORMERS SHALL CONFORM TO STANDARD PLAN S-125.

ARRANGEMENT OF TERMINALS & TERMINAL BOARDS SHALL CONFORM TO STANDARD PLAN S-126.

AERIAL AND UNDERGROUND CABLE ENTRANCES MUST BE SEALED IN ACCORDANCE WITH INSTRUCTIONS I-102.

TERMINALS & LIGHTNING ARRESTERS SHALL BE LIMITED TO ACTUAL QUANTITY REQUIRED.

CABLE & MESSENGER SHALL BE PULLED TIGHT BY HAND.

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

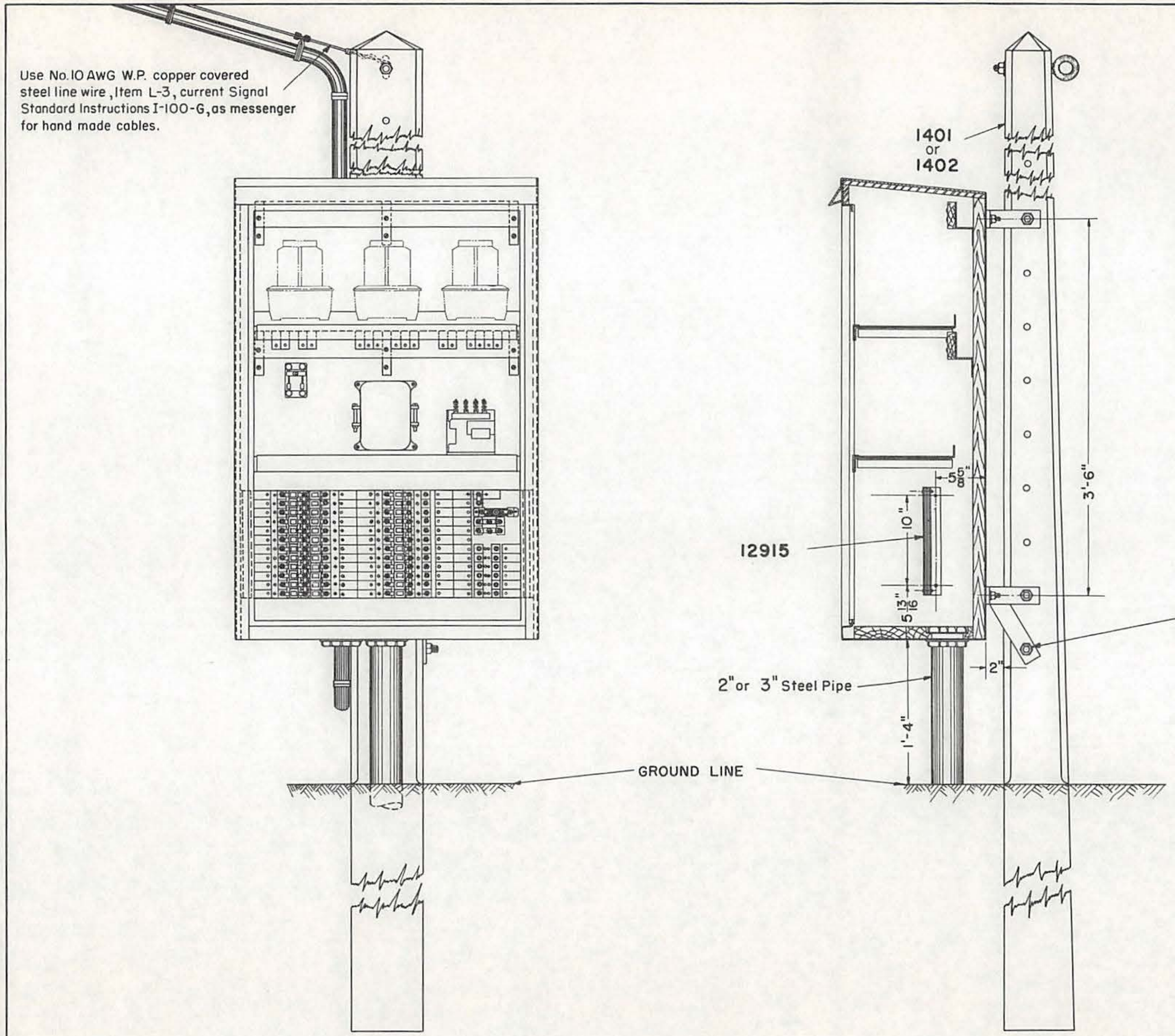
TYPICAL ARRANGEMENT OF APPARATUS IN 6 WAY RELAY CASE G.R.S. NO. 54311-96-GR.I

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 15, 1948

Revised 3-1-50 account 7" locating [illegible]sion for terminal board.

Test terminals and resistor moved to terminal board. 2-26-52

S-121-B


Use No. 10 AWG W.P. copper covered steel line wire, Item L-3, current Signal Standard Instructions I-100-G, as messenger for hand made cables.
1401
or
1402
12915
5 5/8"
10"
5 13/16"
3'-6"
2"
2" or 3" Steel Pipe
1'-4"
GROUND LINE
5/8"-11x9-1/2" Galv. Sq. Hd. Mach. Bolt with Hex. Nut & Spring Washer.

Size and type of relays, transformers and rectifiers may vary, but similar spacing must be provided.

Apply NO-OX-ID "A" Special grease (Item 17, I-135-A.) between relay housing and points of support before erecting.

Arrangement of terminals and terminal boards shall conform to Standard Plan S-126-F.

Terminals and lightning arresters shall be limited to actual quantity required.

Cable and messenger shall be pulled tight by hand.

APPROVED: A. L. Jordan
Signal Engineer

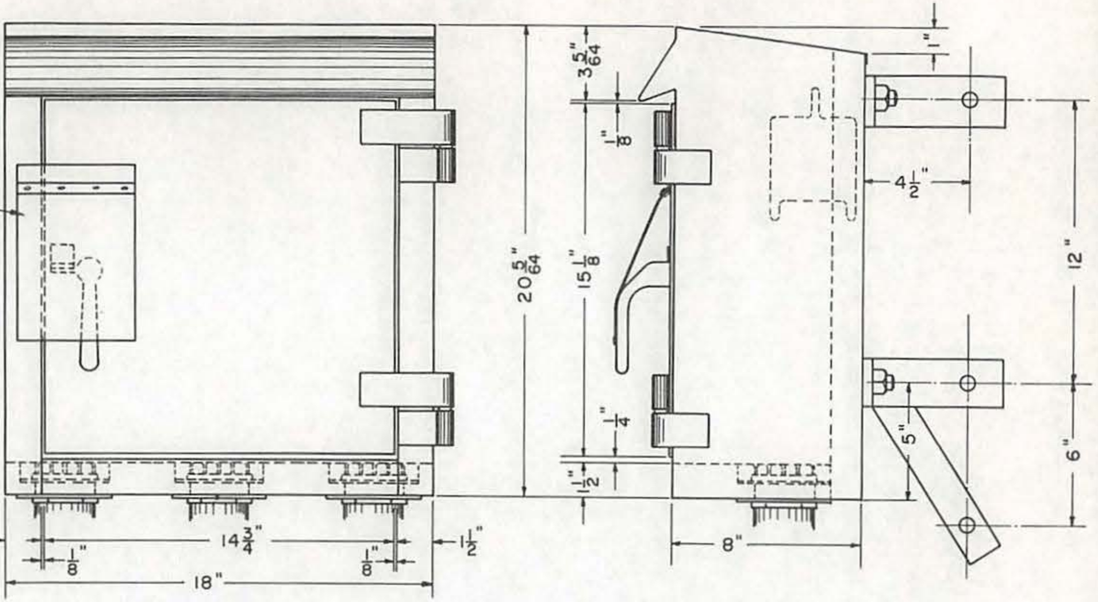
BALTIMORE & OHIO RAILROAD

TYPICAL ARRANGEMENT OF APPARATUS IN 6 WAY RELAY HOUSING NO. 1202

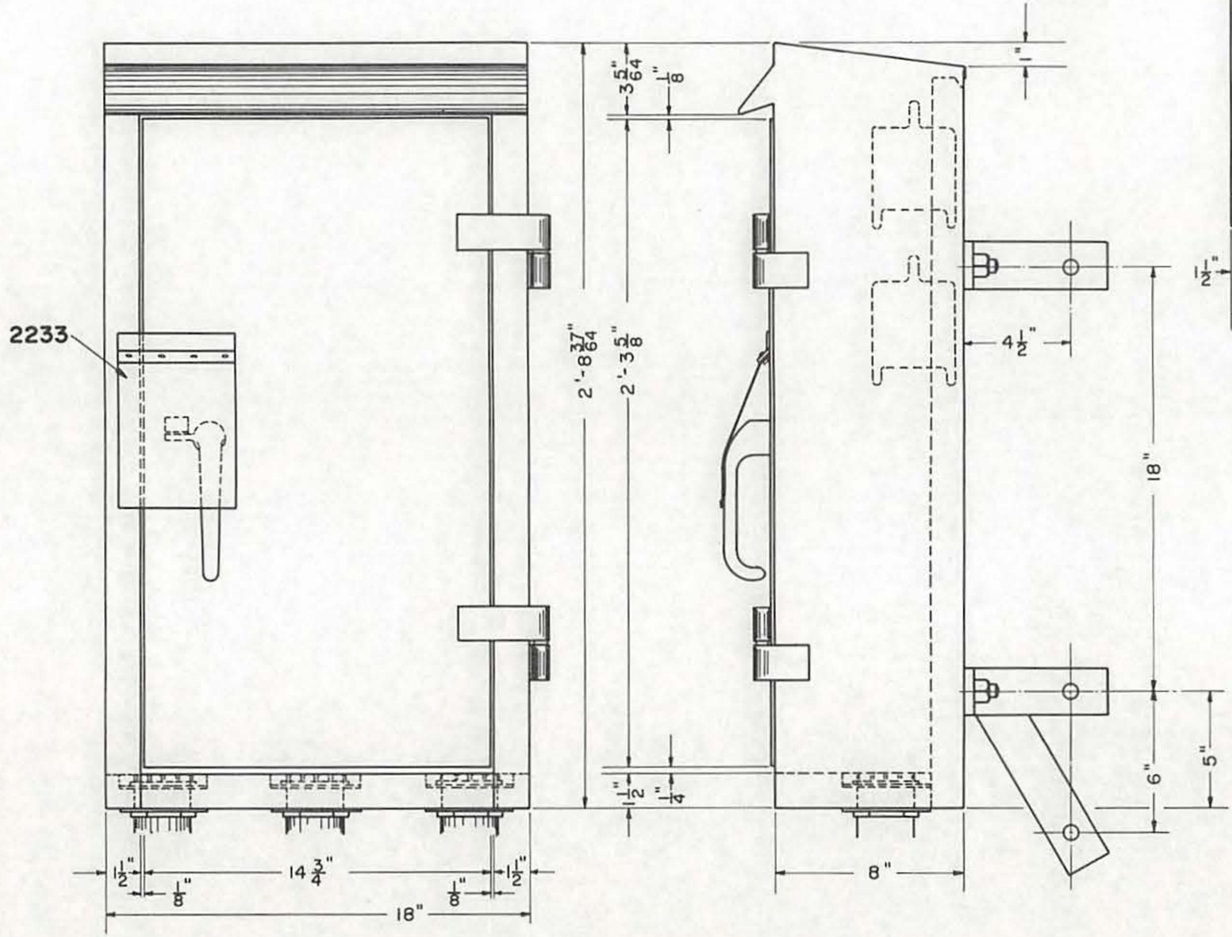
Office of Signal Engineer
Baltimore, Md.
Sept. 5, 1958.

Plan dated: Sept. 15, 1948.
Revised 3-1-50: Account 7" locating dimension for terminal board.
Revised 2-26-52: Test terminals and resistor moved to terminal board.
Revised 1-16-53: Account relocating terminal board.
Revised 1-31-56: Note removed.
Revised 9-5-58: Terminal Board revised.

S-121-E


2233
3 5/64"
1"
1/8"
20 5/64"
15 1/8"
4 1/2"
12"
1/4"
1 1/2"
5"
6"
8"
1 1/2"
1/8"
14 3/4"
1/8"
1 1/2"
18"

48 - TERMINAL SHEET METAL TERMINAL HOUSING - 1221


2233
3 5/64"
1/8"
1"
2'-8 37/64"
2'-3 5/8"
4 1/2"
18"
6"
5"
1 1/2"
1/4"
1 1/2"
14 3/4"
1/8"
1/8"
1 1/2"
18"
8"

96 - TERMINAL SHEET METAL TERMINAL HOUSING - 1222

NOTES:

Cases to be provided with Aerial Cable Knockouts on both sides. See Dwg. S-223-A and specify size and number of couplings required.

Cases shall be painted in accordance with current Instructions I-134 C.

Cases shall be constructed of corrosive resistant steel.

3-Point type of Latch shall be used.

Conduit, bushings, and Locknuts to be furnished by railroad.

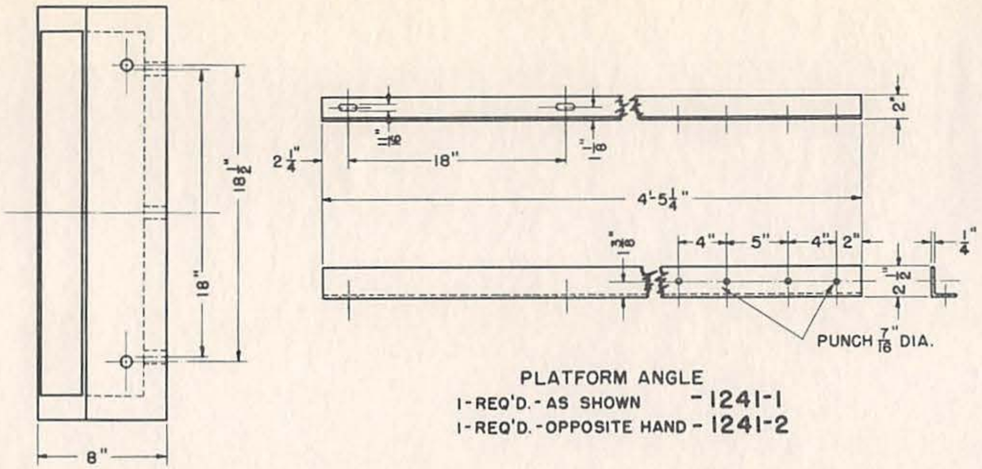
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SHEET METAL TERMINAL HOUSINGS
Office of Signal Engineer
Baltimore, Md.
Sept. 2, 1958

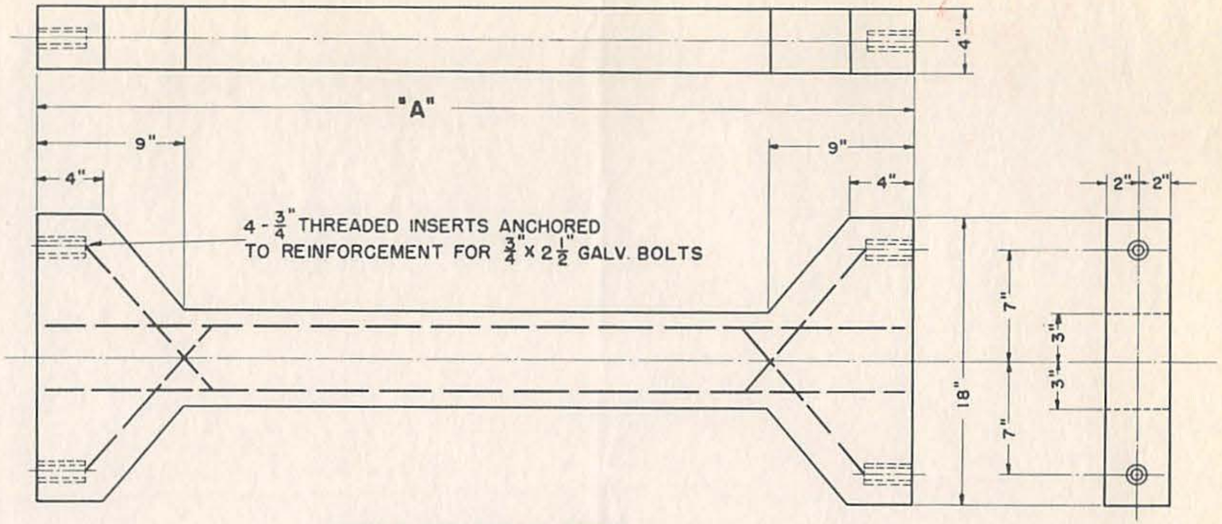
Plan dated: June 11, 1951 - Adopted May 15, 1951.
Revised: Sept. 2, 1958.

Sheet No. 1

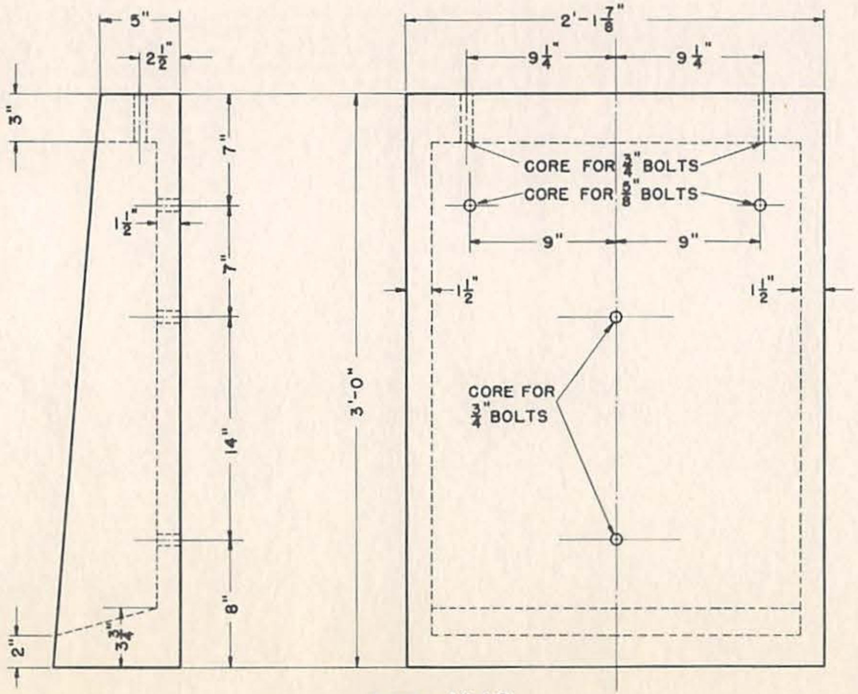
S-122-A


18½"
18"
8"
2¼"
1/2"
18"
1/8"
4'-5¼"
2"
3/8"
4"
5"
4"
2"
1/4"
1/2"
2½"
PUNCH 7/16" DIA.

PLATFORM ANGLE
1-REQ'D.-AS SHOWN - 1241-1
1-REQ'D.-OPPOSITE HAND - 1241-2


4"
"A"
9"
9"
4"
4"
2"
2"
4-¾" THREADED INSERTS ANCHORED TO REINFORCEMENT FOR ¾" x 2½" GALV. BOLTS
18"
7"
7"
3"
3"

STRUT-"A"=2'-5"-1243
STRUT-"A"=4'-8¼"-1244
STRUT-"A"=6'-6¼"-1245
REINFORCED CONCRETE


5"
2½"
3"
1½"
7"
7"
14"
8"
2"
3¼"
3'-0"
2'-1⅞"
9¼"
9¼"
CORE FOR ¾" BOLTS
CORE FOR ⅝" BOLTS
9"
9"
1½"
1½"
CORE FOR ¾" BOLTS

PIER - 1242
REINFORCED CONCRETE

MATERIAL REQUIRED FOR ONE INSTRUMENT CASE FOUNDATION COMPLETE							
ITEM NO.	9-WAY G.R.S. NO. 56101-131 GR.I	12-WAY G.R.S. NO. 56101-94 GR.I	24-WAY G.R.S. NO. 56101-95 GR.I	36-WAY G.R.S. NO. 56101-96 GR.I			
1242	2	2	2	2			
1243	1						
1244		1	1				
1245				1			
3/4" DIA. X 2 1/2" LG. MACH. BOLTS	4	4	4	4			
3/4" DIA. X 7" LG. MACH. BOLTS	4	4	4	4			
3/4" GALV. FLAT WASHERS	8	8	8	8			

NOTE:

FOUNDATIONS ARE SHIPPED KNOCKED-DOWN AND ARE TO BE ASSEMBLED IN THE FIELD.

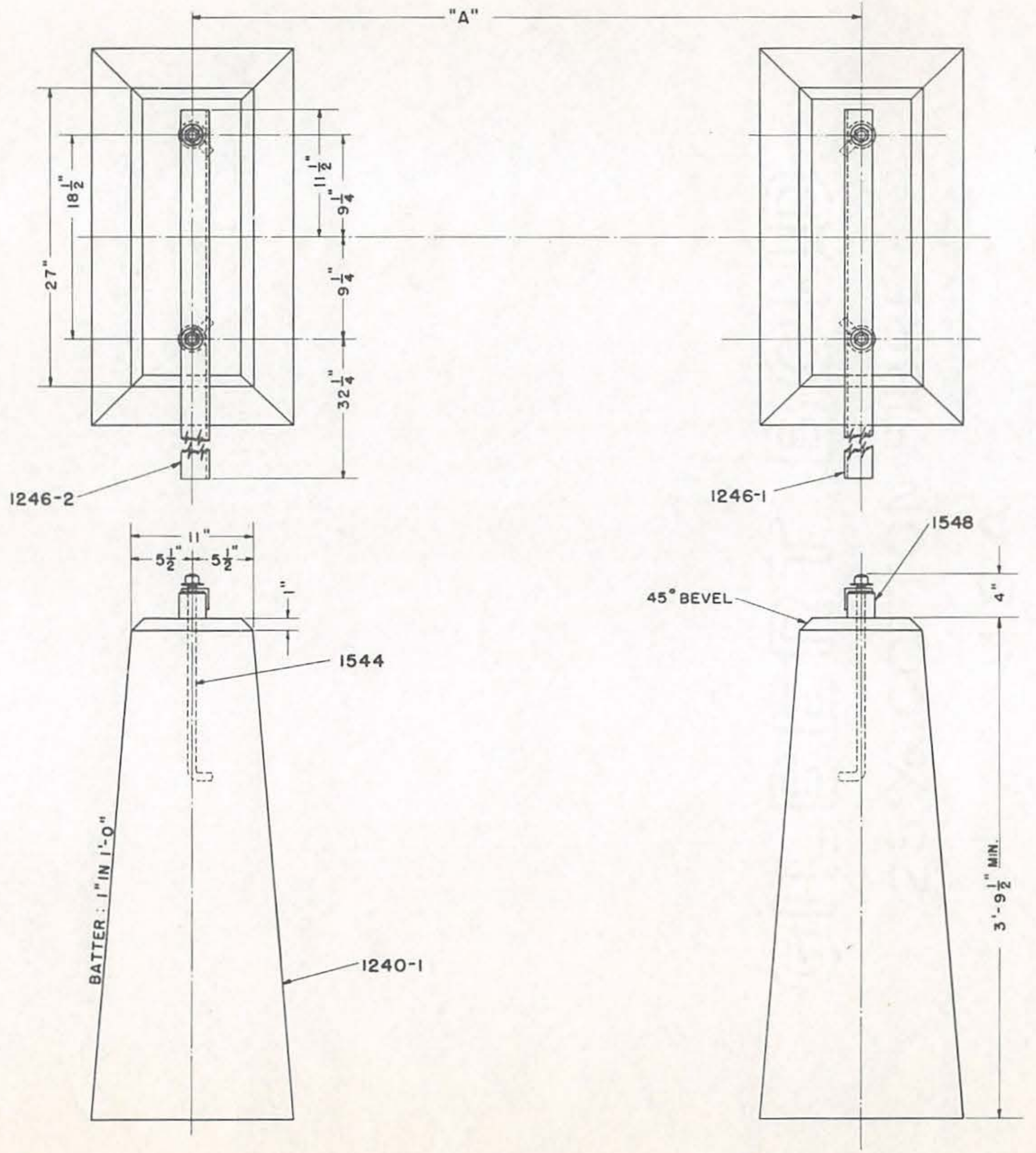
PLATFORM ANGLES TO BE USED ONLY WHEN PLATFORM IS REQUIRED.

BOLTS TO BE GALVANIZED WITH SQ. HEAD & HEX. NUT.

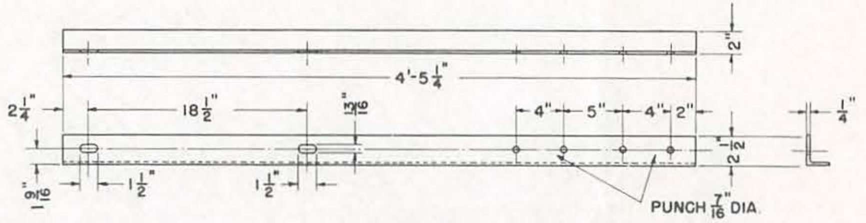
APPROVED: A.S. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
PRECAST CONCRETE FOUNDATIONS FOR INSTRUMENT CASES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 26, 1948

SHEET NO. 1
S-124


"A"
18 1/2"
27"
11 1/2"
9 1/4"
9 1/4"
32 1/4"
1246-2
1246-1
11"
5 1/2"
5 1/2"
1"
1544
1548
45° BEVEL
4"
BATTER : 1" IN 1'-0"
3'-9 1/2" MIN.
1240-1

DIMENSION "A"	RELAY CASE
2'-10"	56101-131-GR.1 (9 WAY) G.R.S. CO.
5'-1 1/4"	56101-94-GR.1 (12 WAY) G.R.S. CO.
5'-1 1/4"	56101-95-GR.1 (24 WAY) G.R.S. CO.
6'-11 1/4"	56101-96-GR.1 (36 WAY) G.R.S. CO.
9'-10 1/4"	56101-127-GR.1 (48 WAY) G.R.S. CO.


2"
4'-5 1/4"
2 1/4"
18 1/2"
13/16"
4"
5"
4"
2"
1/4"
2 1/2"
1 9/16"
1 1/2"
1 1/2"
PUNCH 7/16" DIA.

PLATFORM ANGLE
1-REQ'D.-AS SHOWN - 1246-1
1-REQ'D.-OPPOSITE HAND - 1246-2

NOTE:

FOUNDATION SHALL BE MADE OF PORTLAND CEMENT CONCRETE IN ACCORDANCE WITH INSTRUCTIONS GOVERNING THE MAINTENANCE OF WAY DEPARTMENT, RULES 875 TO 905 INCLUSIVE.

PLATFORM ANGLES TO BE USED ONLY WHEN PLATFORM IS REQUIRED.

CENTER PIER REQUIRED FOR RELAY CASE 56101-127-GR.1 (48 WAY) G.R.S.CO. (SEE PLAN S-118 FOR DIMENSIONS.)

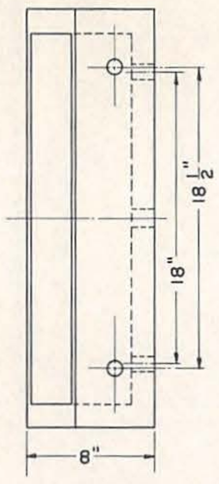
THIS PLAN TO BE USED ONLY FOR FOUNDATIONS CONSTRUCTED IN THE FIELD.

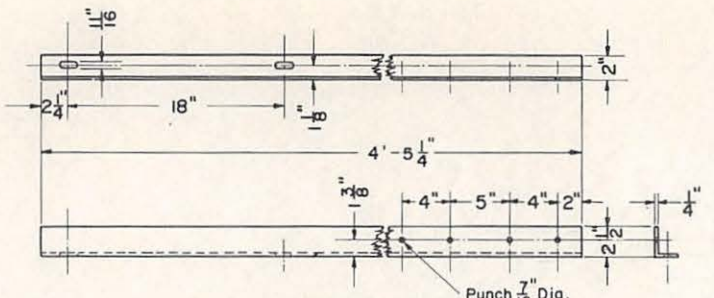
APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
DEC. 18, 1946

SHEET NO. 2
S-124

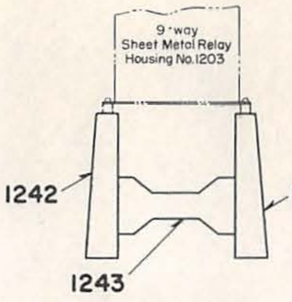
RECEIVED
OCT 18 1949
SPECIFICATION DEPT.





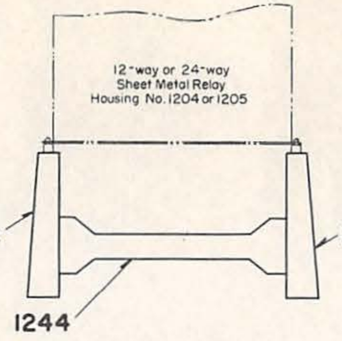
11/16"
2"
2 1/4"
18"
1/8"
4'-5 1/4"
1 3/8"
4"
5"
4"
2"
1/4"
2 1/2"
Punch 7/16" Dia.

PLATFORM ANGLE
1-Req'd.-as shown - **1241-1**
1-Req'd.- opposite hand - **1241-2**



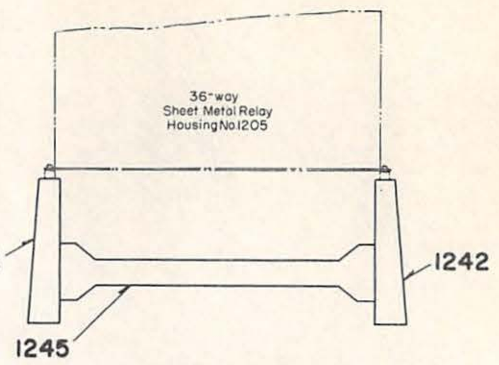
9-way
Sheet Metal Relay
Housing No.1203
1242
1242
1243

ASSEMBLY - **12413**



12-way or 24-way
Sheet Metal Relay
Housing No.1204 or 1205
1242
1244

ASSEMBLY - **12414**



36-way
Sheet Metal Relay
Housing No.1205
1242
1242
1245

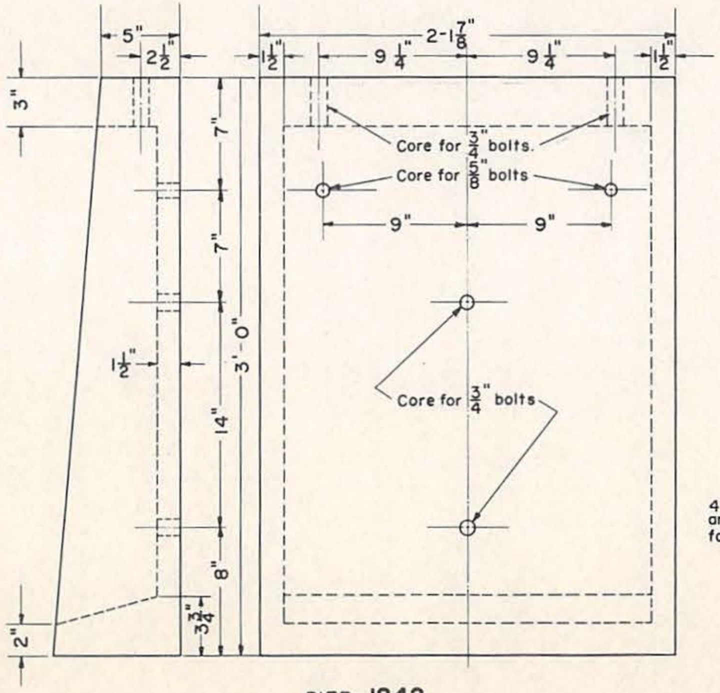
ASSEMBLY - **12415**

NOTES:

Furnish with each assembly 4-3/4 x 2 1/2" Hot Dip Galv. U.S. St'd. Machine Bolts and 4-3/4"x 7" Hot Dip Galv. U.S. Std. Machine Bolts with flat washers and Hex. Nuts.

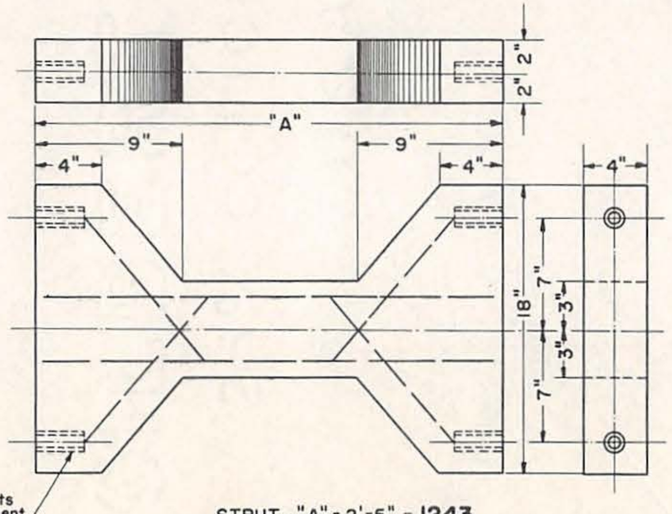
Foundations are shipped knocked-down and are to be assembled in the field.

Platform angles to be used only when platform is required.



5"
2 1/2"
3"
1 1/2"
2-1 7/8"
9 1/4"
9 1/4"
1 1/2"
7"
7"
3'-0"
14"
8"
1 1/2"
3 3/4"
2"
Core for 3/4" bolts.
Core for 5/8" bolts
9"
9"
Core for 3/4" bolts

PIER - **1242**
Reinforced Concrete



2"
2"
"A"
9"
9"
4"
4"
4"
18"
7"
3"
3"
7"

4-3/4" Threaded inserts anchored to reinforcement for 3/4"x2 1/2 Galv. Bolts.

STRUT - "A" = 2'-5" - **1243**
STRUT - "A" = 4'-8 1/4" - **1244**
STRUT - "A" = 6'-6 1/4" **1245**
Reinforced Concrete

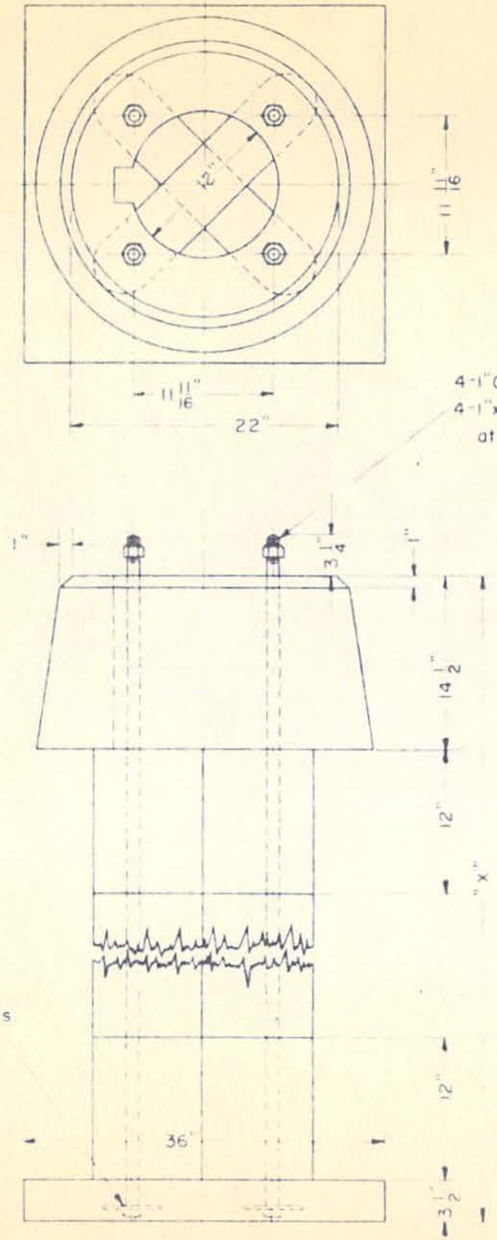
Approved: ______________________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
PRECAST CONCRETE FOUNDATIONS FOR SHEET METAL RELAY HOUSINGS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
July 25,1950

Sheet No. 1

S-124-A

New plan made account showing assemblies.

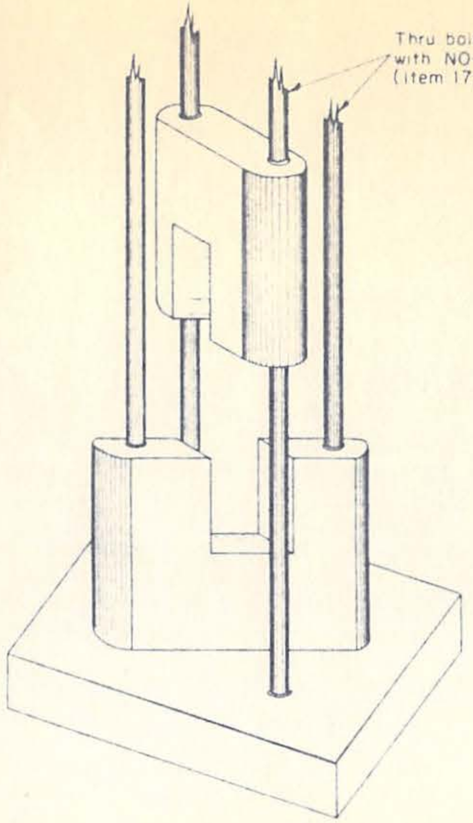


4-1" Galv Hex Nuts
4-1"x 5'-9-1/2" for 1249 / 6'-9-1/2 for 12410 Galv Rods, 2-1/4" th'd at top and 1" th'd at bottom

1" Sq Nut with 2-6" pcs
3/8" Spurs welded

FOUNDATION FOR USE WITH A AR BASE NO 14713 ("x =5'-6")-1249
For Automatic Crossing Gates

FOUNDATION FOR USE WITH A AR BASE NO 16143("x"=6'-6")-12410
For Ground Mast Signals



Thru bolts to be thoroughly coated with NO-OX-ID "A" Special grease (item 17, I-135) when assembling

SECTION SHOWING METHOD OF ASSEMBLY

Notes:

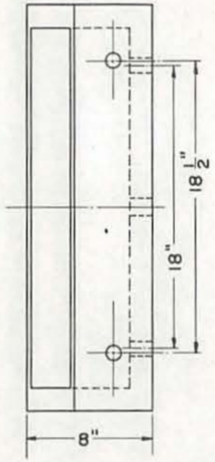
Before assembling foundation a coating of NO-OX-ID "A" Special grease (item 17, I-135) must be brushed on the Galvanized Thru bolts. Grease must also be melted and poured into the voids between the bolts and the cored holes of the Spiders.

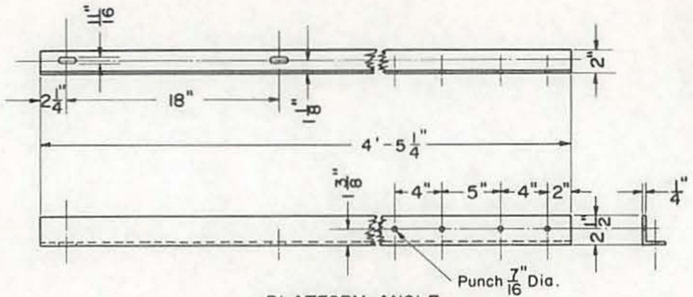
Base section must be level before assembling spiders. After spiders are slipped over thru bolts and top block lifted in place, the foundation should again be checked for level and back filled. Earth must be thoroughly tamped around the spiders.

Approved A. L. Jordan
Signal Engineer

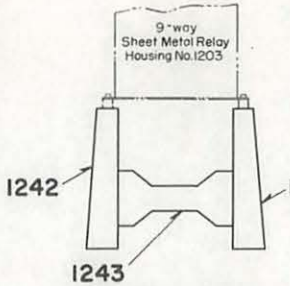
BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS
Office of Signal Engineer
Baltimore, Md
Oct 18, 1955

Sheet No 5
S-124-B

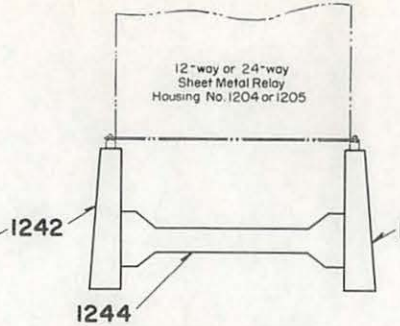



11/16"
2"
2 1/4"
18"
1/8"
4'-5 1/4"
13/8"
4"
5"
4"
2"
1/4"
2 1/2"
Punch 7/16" Dia.

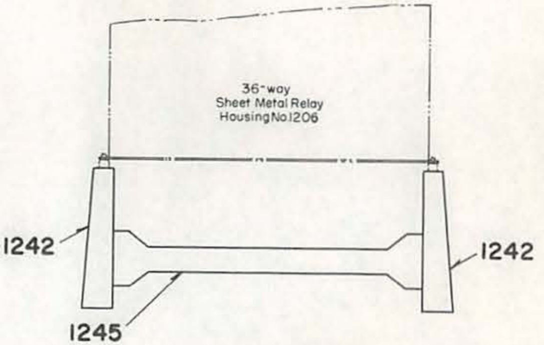
PLATFORM ANGLE
1-Req'd.-as shown - **1241-1**
1-Req'd.-opposite hand - **1241-2**


9-way Sheet Metal Relay Housing No.1203
1242
1242
1243

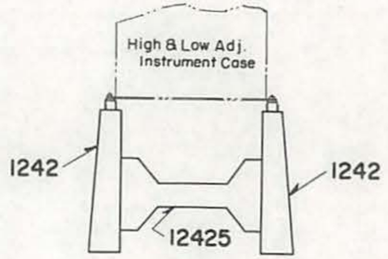
ASSEMBLY - **12413**


12-way or 24-way Sheet Metal Relay Housing No. 1204 or 1205
1242
1244

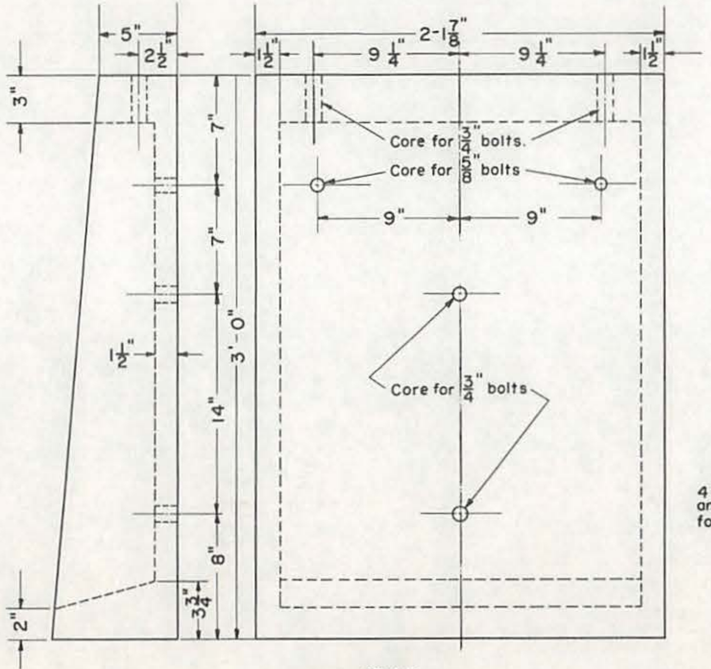
ASSEMBLY - **12414**


36-way Sheet Metal Relay Housing No.1206
1242
1242
1245

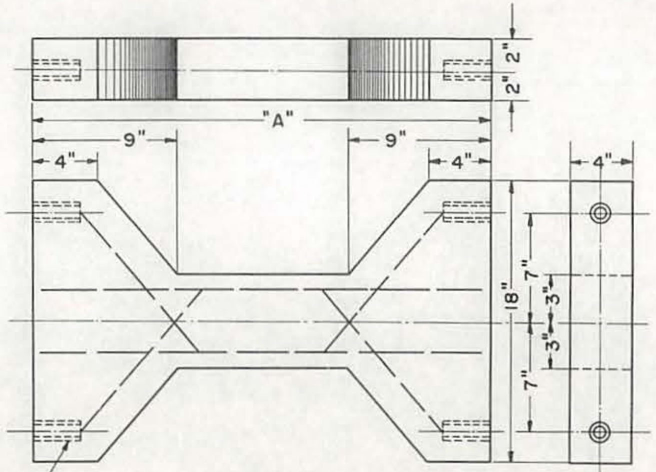
ASSEMBLY - **12415**


High & Low Adj. Instrument Case
1242
1242
12425

ASSEMBLY - **12426**


5"
2 1/2"
2-1 7/8"
1 1/2"
9 1/4"
9 1/4"
1 1/2"
3"
7"
7"
1 1/2"
14"
3'-0"
8"
3 3/4"
2"
Core for 3/4" bolts.
Core for 3/8" bolts
9"
9"
Core for 3/4" bolts

PIER - **1242**
Reinforced Concrete


2"
2"
"A"
9"
9"
4"
4"
4"
18"
7"
3"
3"
7"
4-3/4" Threaded inserts anchored to reinforcement for 3/4"x2 1/2 Galv. Bolts.

STRUT - "A" = 2'-5" - **1243**
STRUT - "A" = 4'-8 1/4" - **1244**
STRUT - "A" = 6'-6 1/4" **1245**
STRUT - "A" = 2'-11 3/4" **12425**

NOTES:

Furnish with each assembly 4-3/4"x2-1/2" Hot Dip Galv. U.S. St'd. Machine Bolts and 4-3/4"x7" Hot Dip Galv. U.S. St'd. Machine Bolts with flat washers and Hex. Nuts.

Platform angles to be used only when platform is required.

Foundations are shipped knocked-down and are to be assembled in the field.

Approved: A. L. Jordan
Signal Engineer

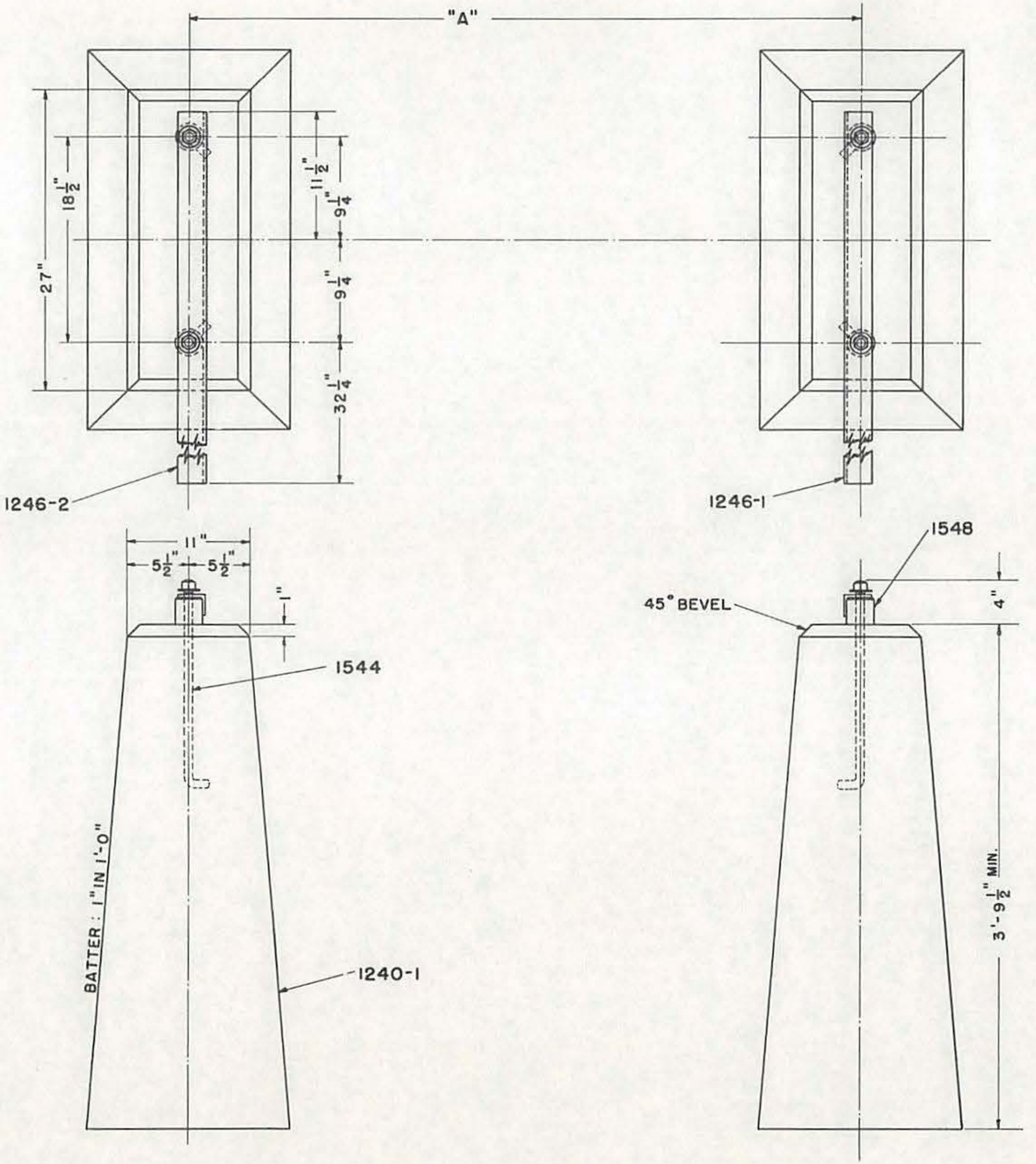
BALTIMORE & OHIO RAILROAD
PRECAST CONCRETE FOUNDATIONS FOR SHEET METAL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

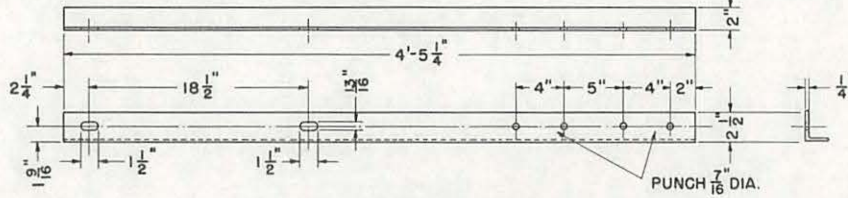
New plan made account showing assemblies 7-25-50.
Revised 2-1-56: Assembly 12426 added.
Revised: 9-26-56.
Revised: 6-2-58.

Sheet No. 1

S-124-D

DIMENSION "A"	RELAY CASE
2'-10"	56101-131-GR.1 (9 WAY) G.R.S. CO.
5'-1¼"	56101-94-GR.1 (12 WAY) G.R.S. CO.
5'-1¼"	56101-95-GR.1 (24 WAY) G.R.S. CO.
6'-11¼"	56101-96-GR.1 (36 WAY) G.R.S. CO.


"A"
18½"
27"
11½"
9¼"
9¼"
32¼"
1246-2
1246-1
11"
5½"
5½"
1"
1544
1548
45° BEVEL
4"
3'-9½" MIN.
BATTER: 1" IN 1'-0"
1240-1


2"
4'-5¼"
2¼"
18½"
13/16"
4"
5"
4"
2"
¼"
½"
2½"
9/16"
1½"
1½"
PUNCH 7/16" DIA.

PLATFORM ANGLE
1-REQ'D.-AS SHOWN - 1246-1
1-REQ'D.-OPPOSITE HAND - 1246-2

NOTE:

FOUNDATION SHALL BE MADE OF PORTLAND CEMENT CONCRETE IN ACCORDANCE WITH RULES & INSTRUCTIONS GOVERNING THE MAINTENANCE OF WAY DEPARTMENT, RULE 1630.

PLATFORM ANGLES TO BE USED ONLY WHEN PLATFORM IS REQUIRED.

THIS PLAN TO BE USED ONLY FOR FOUNDATIONS CONSTRUCTED IN THE FIELD.

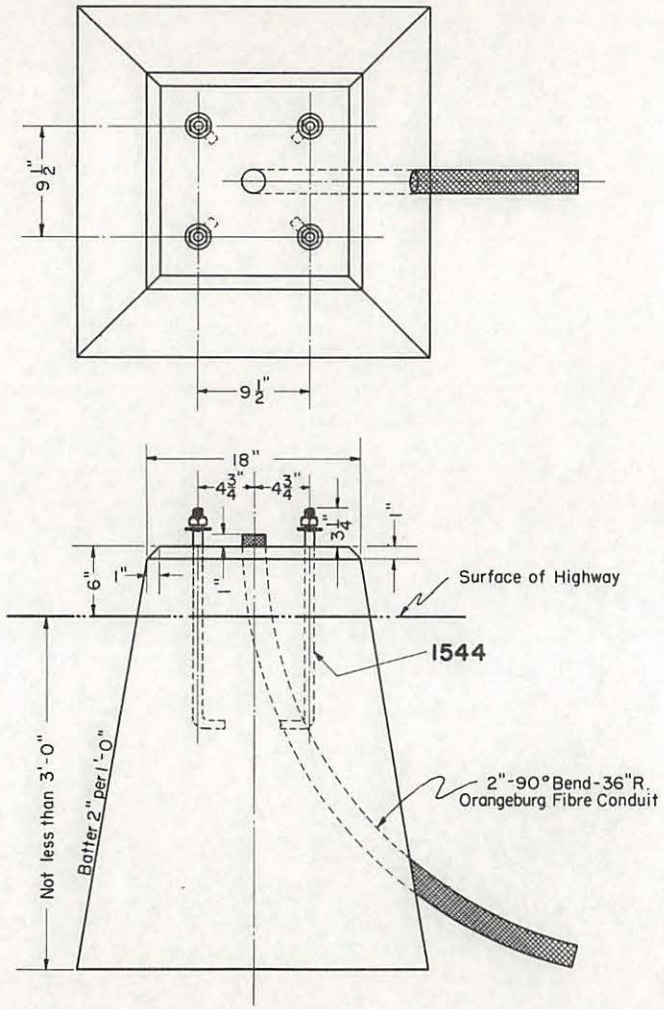
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

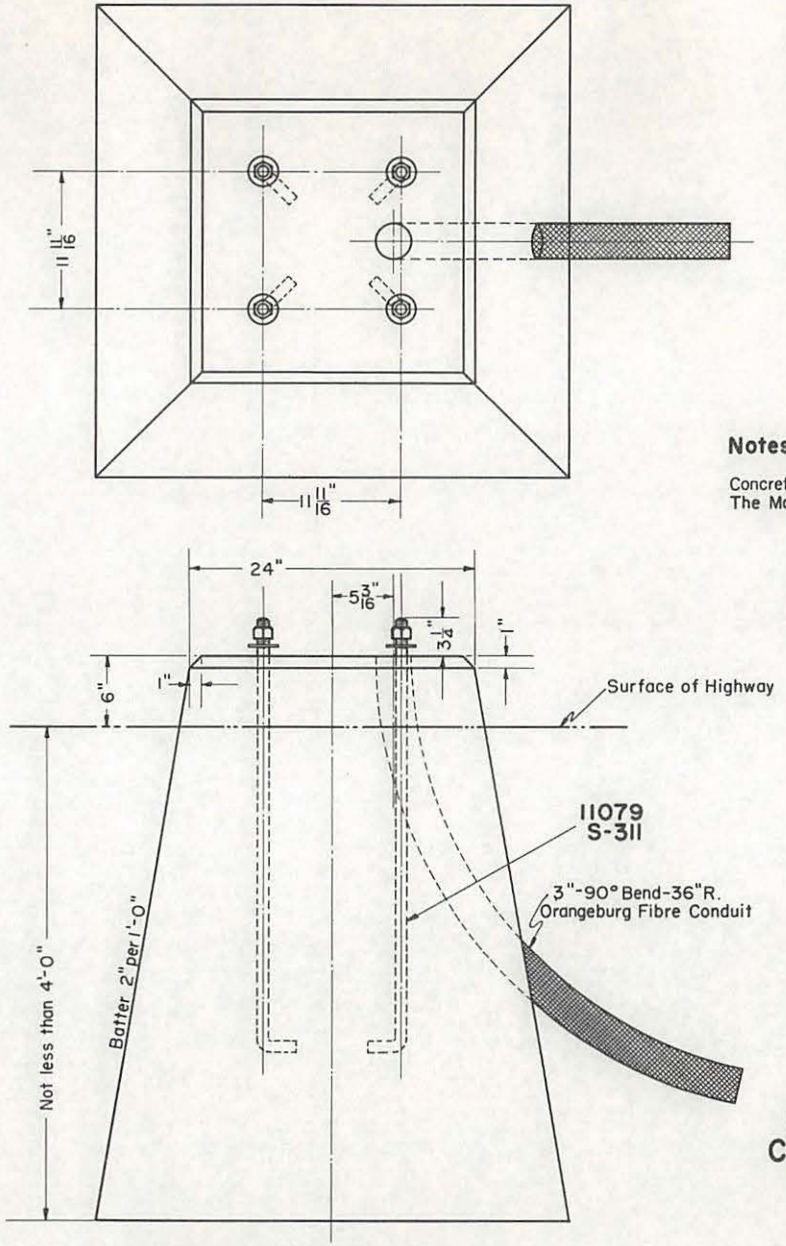
Made & Corrected-12-18-46.
Revised 11-18-52: Referance to 48-way case removed.
Revised 9-26-56:
Revised 6-2-58: Rules 875 to 905 inclusive changed to Rule 1630.

SHEET NO. 2

S-124-D


9½"
9½"
18"
4¾"
4¾"
3¼"
1"
1"
6"
1"
Surface of Highway
1544
2"-90° Bend-36"R.
Orangeburg Fibre Conduit
Not less than 3'-0"
Batter 2" per 1'-0"

FOUNDATION FOR FLASHING LIGHT SIGNAL-1247


11 11/16"
11 11/16"
24"
5 3/16"
3¼"
1"
6"
1"
Surface of Highway
11079
S-311
3"-90° Bend-36"R.
Orangeburg Fibre Conduit
Not less than 4'-0"
Batter 2" per 1'-0"

FOUNDATION FOR FLASHING LIGHT SIGNAL
WITH SHORT ARM GATE - 1248

Notes:

Foundation shall be made of Portland Cement Concrete in accordance with Rules & Instructions governing The Maintenance of Way Department, Rule 1630.

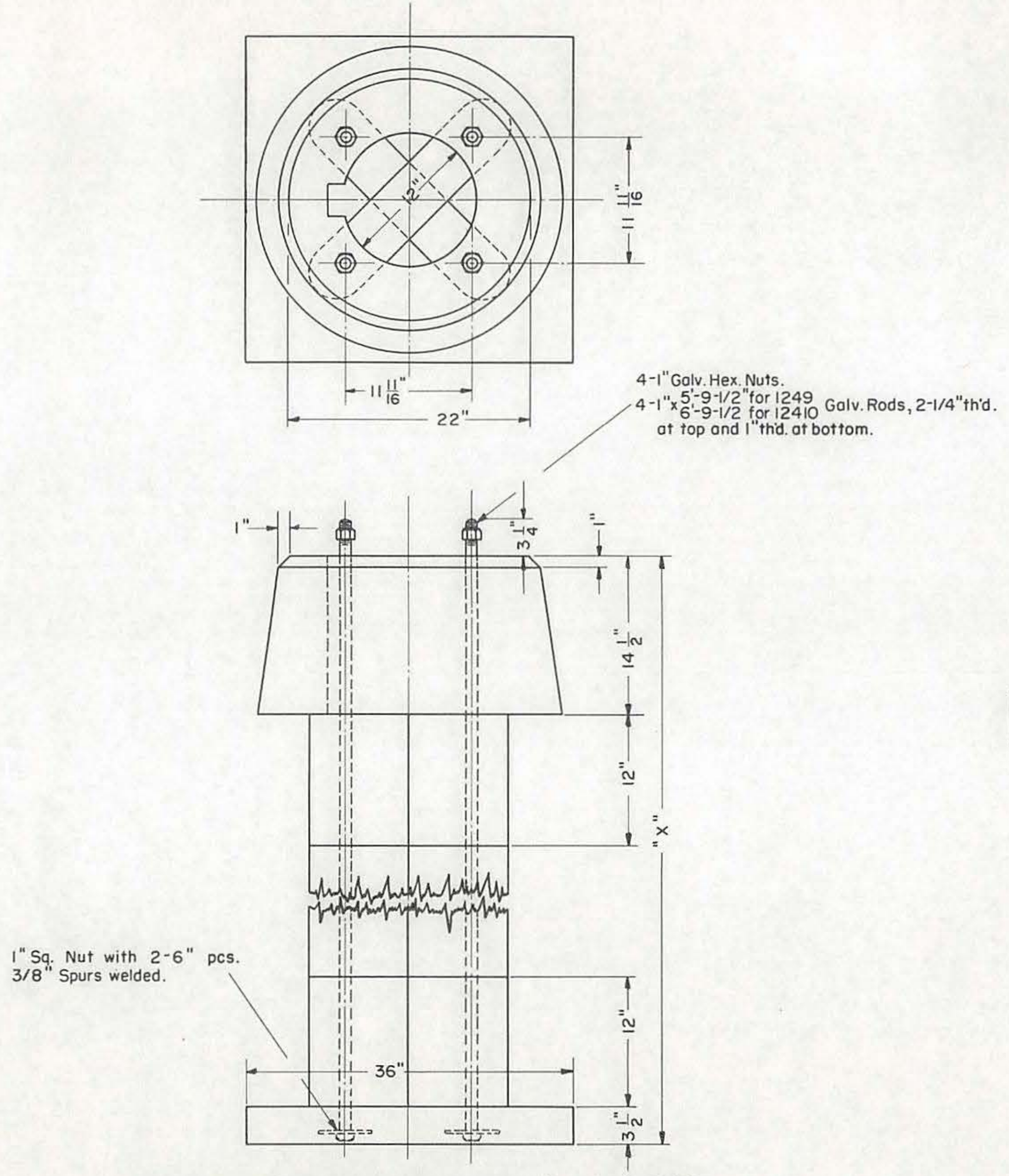
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Sheet No. 3

S-124-D

Made & Corrected 10-25-49.
Adopted 4-26-50.
Revised 9-26-56.
Revised 6-2-58: Rules 875 to 905 inclusive changed to Rule 1630.

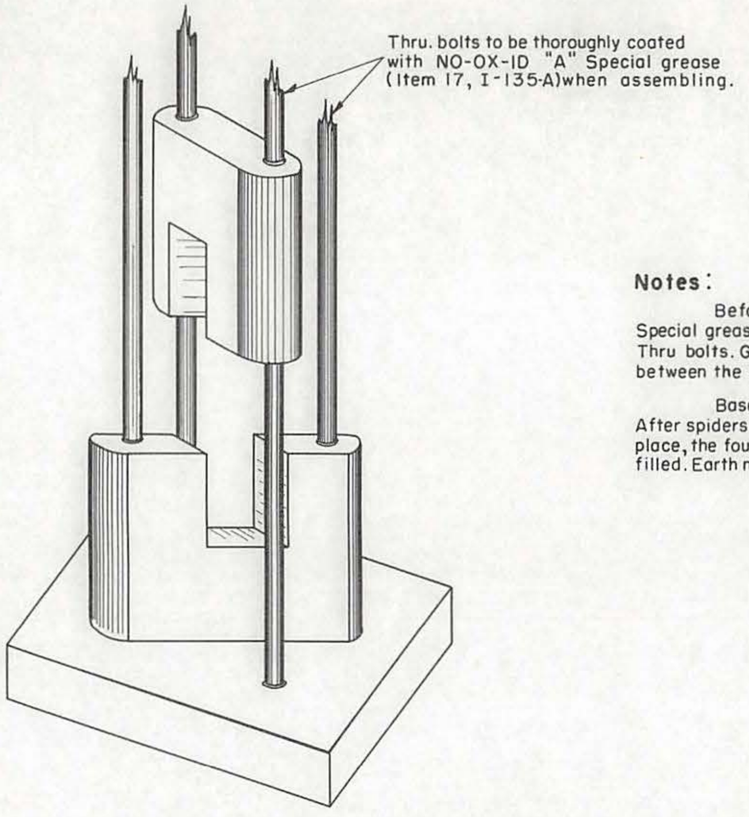

12"
11 11/16
11 11/16"
22"
4-1" Galv. Hex. Nuts.
4-1"x 5'-9-1/2" for 1249 / 6'-9-1/2 for 12410 Galv. Rods, 2-1/4" th'd. at top and 1" th'd. at bottom.
1"
3 1/4
1"
14 1/2
12"
"X"
1" Sq. Nut with 2-6" pcs. 3/8" Spurs welded.
12"
36"
3 1/2"

FOUNDATION FOR USE WITH A AR BASE NO. 14713 ("X = 5'-6") - **1249**

For Automatic Crossing Gates

FOUNDATION FOR USE WITH A AR BASE NO. 16143 ("X" = 6'-6") - **12410**

For Ground Mast Signals


Thru. bolts to be thoroughly coated with NO-OX-ID "A" Special grease (Item 17, I-135-A) when assembling.

SECTION SHOWING METHOD OF ASSEMBLY

Notes:

Before assembling foundation a coating of NO-OX-ID "A" Special grease (Item 17, I-135-A) must be brushed on the Galvanized Thru bolts. Grease must also be melted and poured into the voids between the bolts and the cored holes of the Spiders.

Base section must be level before assembling spiders. After spiders are slipped over thru. bolts and top block lifted in place, the foundation should again be checked for level and back filled. Earth must be thoroughly tamped around the spiders.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

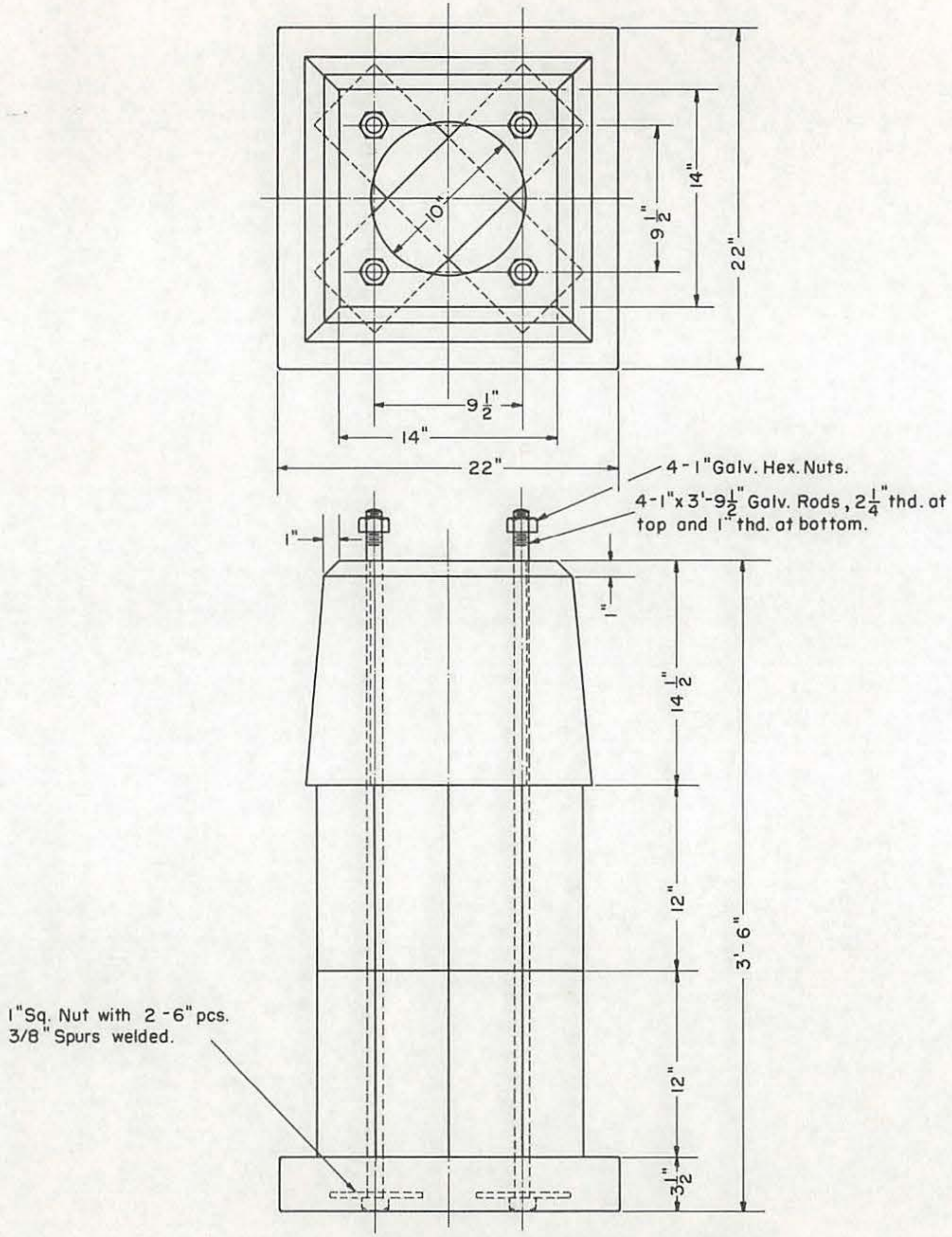
CONCRETE FOUNDATIONS

Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Made & Corrected 9-18-55
Revised: 9-26-56
Revised: 6-2-58.

Sheet No. 5

S-124-D

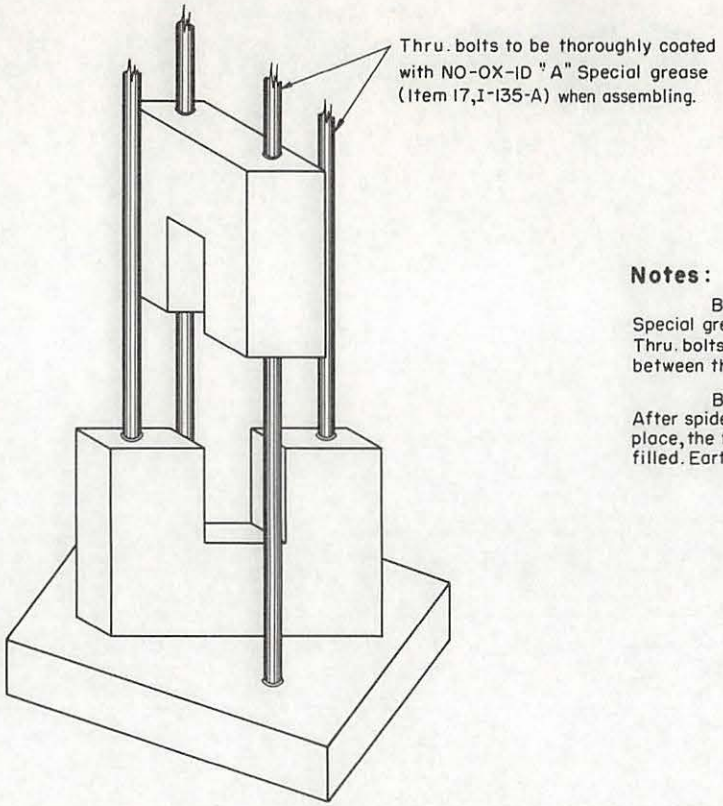


4 - 1" Galv. Hex. Nuts.

4-1"x 3'-9 1/2" Galv. Rods, 2 1/4" thd. at top and 1" thd. at bottom.

1" Sq. Nut with 2 -6" pcs. 3/8" Spurs welded.

FOUNDATION FOR USE WITH AAR BASE NO. 14492 -12417
For Flashing Light Signals



Thru. bolts to be thoroughly coated with NO-OX-ID "A" Special grease (Item 17, I-135-A) when assembling.

SECTION SHOWING METHOD OF ASSEMBLY

Notes:

Before assembling foundation a coating of NO-OX-ID "A" Special grease (Item 17, I-135-A) must be brushed on the Galvanized Thru. bolts. Grease must also be melted and poured into the voids between the bolts and the cored holes of the Spiders.

Base section must be level before assembling spiders. After spiders are slipped over thru. bolts and top block lifted in place, the foundation should again be checked for level and back filled. Earth must be thoroughly tamped around the spiders.

Approved: A. L. Jordan
Signal Engineer

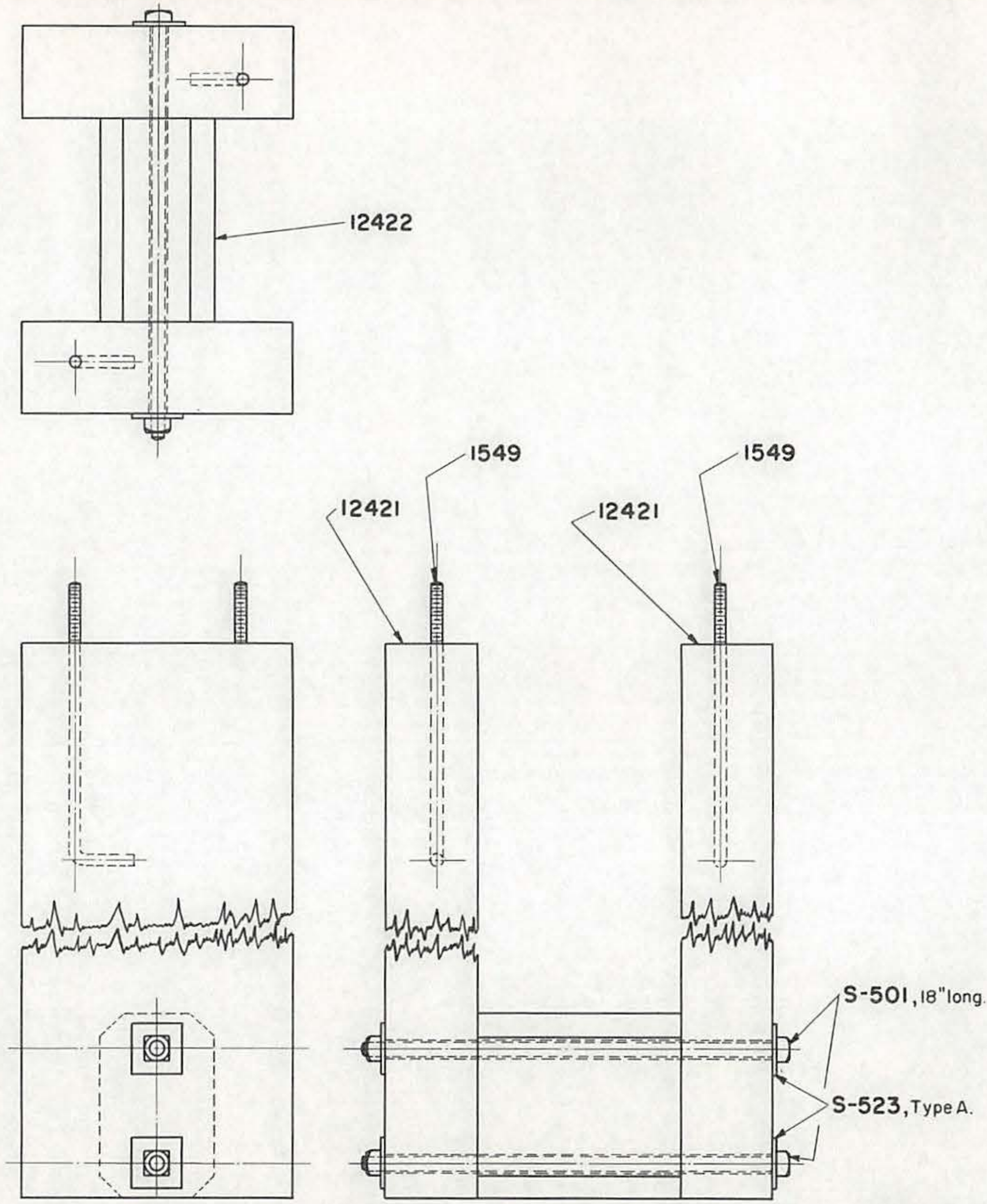
BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Made & Corrected 1-28-52
Adopted: 11-18-52.
Revised: 9-26-56.
Revised: 6-2-58.

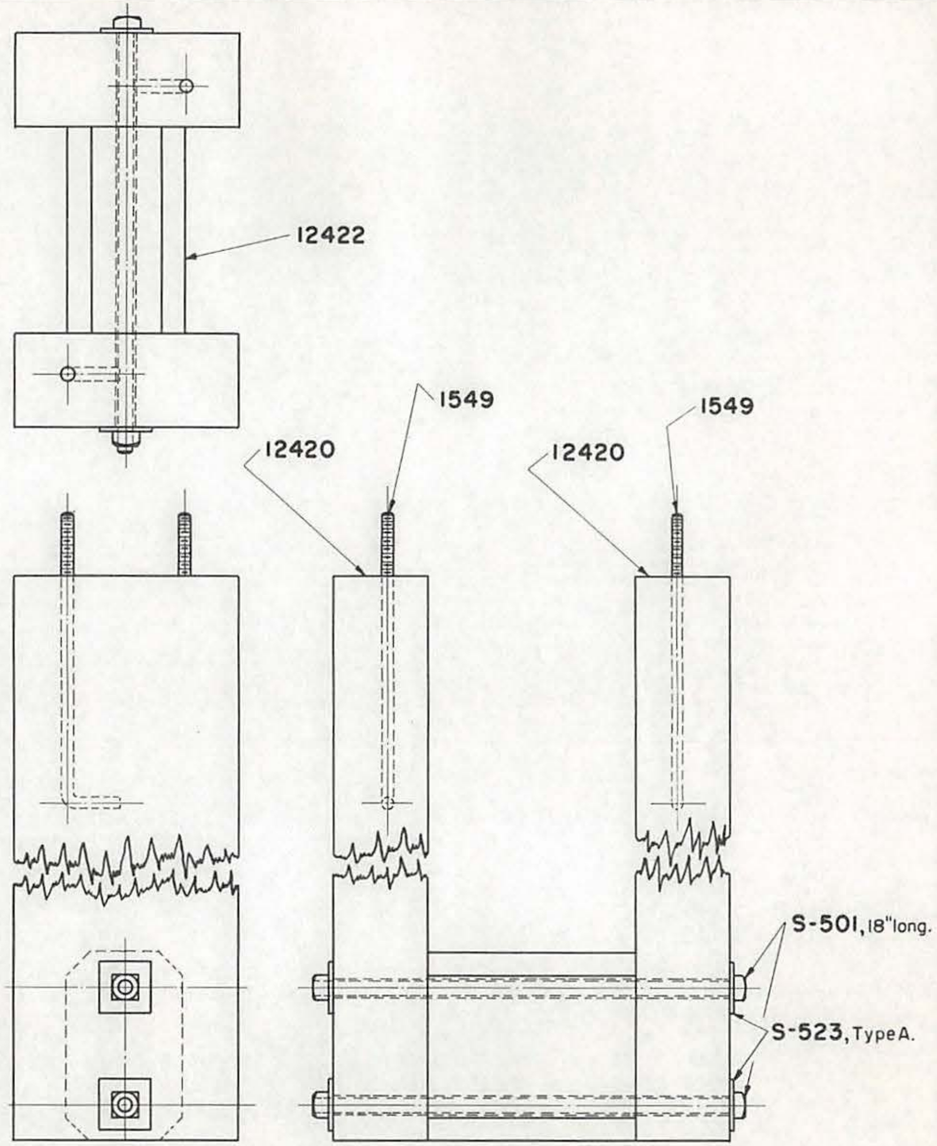
Sheet No. 6

S-124-D

Made & Corrected 9-3-53
Approved: 1-12-54.
Revised: 9-26-56.
Revised: 6-2-58.


12422
1549
1549
12421
12421
S-501, 18" long.
S-523, Type A.

FOUNDATION FOR 22-WAY STYLE "W" JUNCTION BOX - 12423


12422
1549
1549
12420
12420
S-501, 18" long.
S-523, Type A.

FOUNDATION FOR 14-WAY STYLE "W" JUNCTION BOX - 12424

NOTE:-

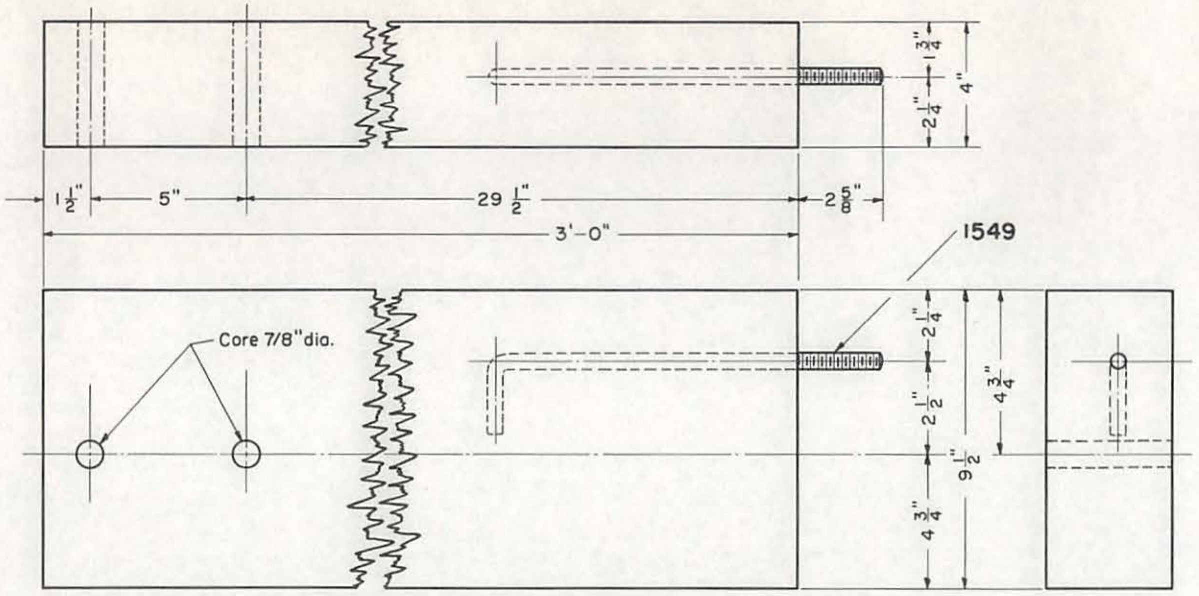
Top of Foundation shall be located sufficient distance above surface of ground to allow free circulation of air beneath Junction Box

Approved: A. L. Jordan
Signal Engineer

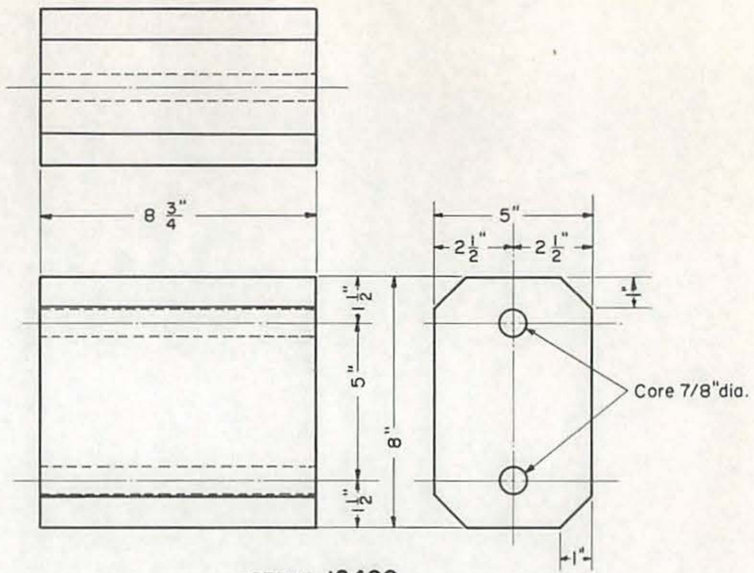
BALTIMORE & OHIO RAILROAD
CONCRETE FOUNDATIONS FOR STYLE "W" JUNCTION BOXES
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Sheet No. 7

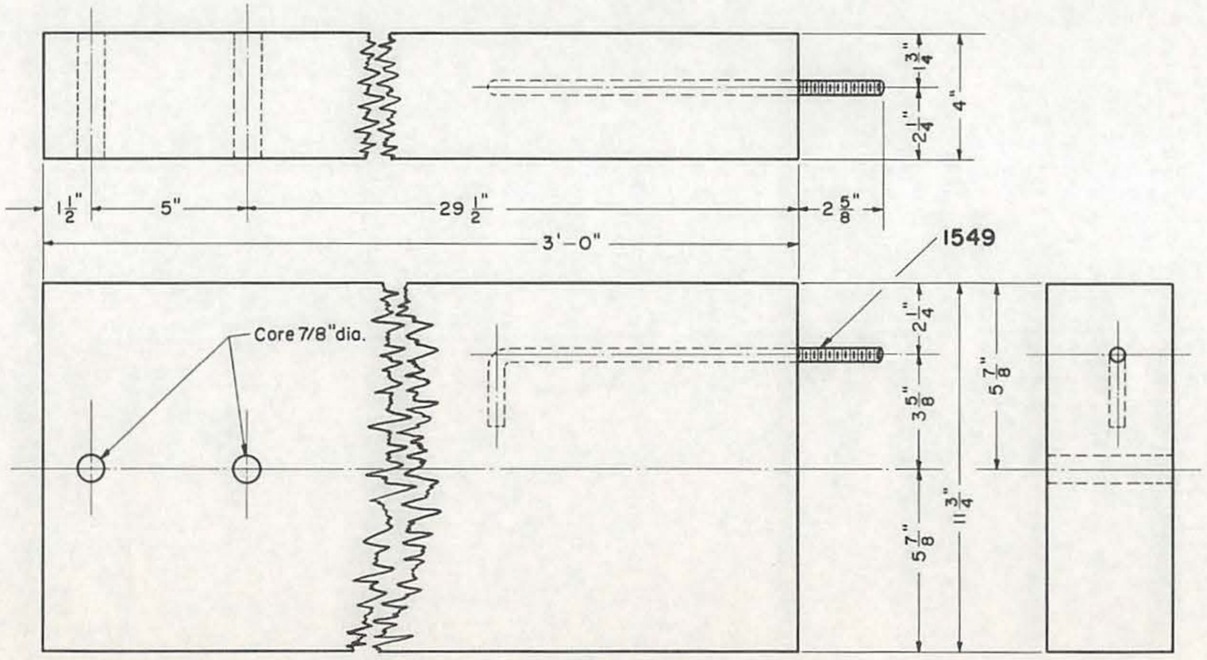
S-124-D


1¾"
2¼"
4"
1½"
5"
29½"
2⅝"
3'-0"
1549
Core 7/8"dia.
2¼"
2½"
4¾"
9½"
4¾"

PIER - **12420**


8¾"
5"
2½"
2½"
1½"
5"
8"
1½"
½"
1"
Core 7/8"dia.

STRUT - **12422**


1¾"
2¼"
4"
1½"
5"
29½"
2⅝"
3'-0"
1549
Core 7/8"dia.
2¼"
3⅝"
5⅞"
11¾"
5⅞"

PIER - **12421**

Note:

Foundation shall be made of Portland Cement Concrete in accordance with Rules & Instructions Governing The Maintenance of Way Department, Rule 1630.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

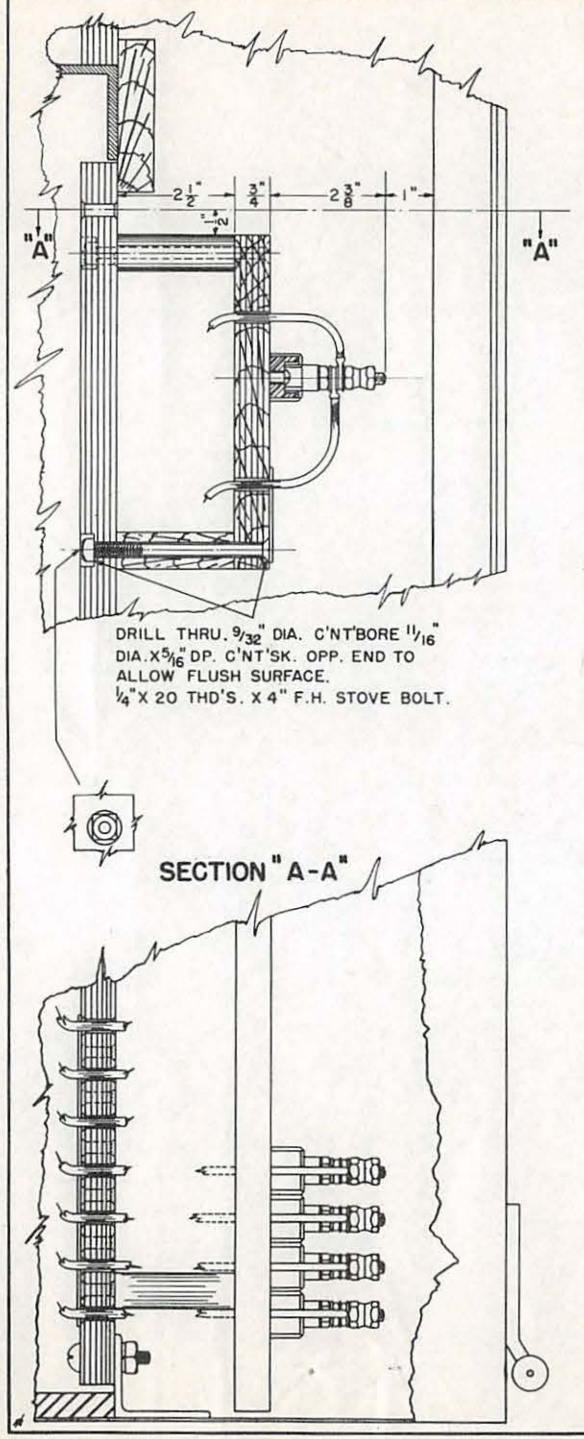
CONCRETE FOUNDATIONS FOR STYLE "W" JUNCTION BOXES

Office of Signal Engineer
Baltimore, Md.
June 2, 1958

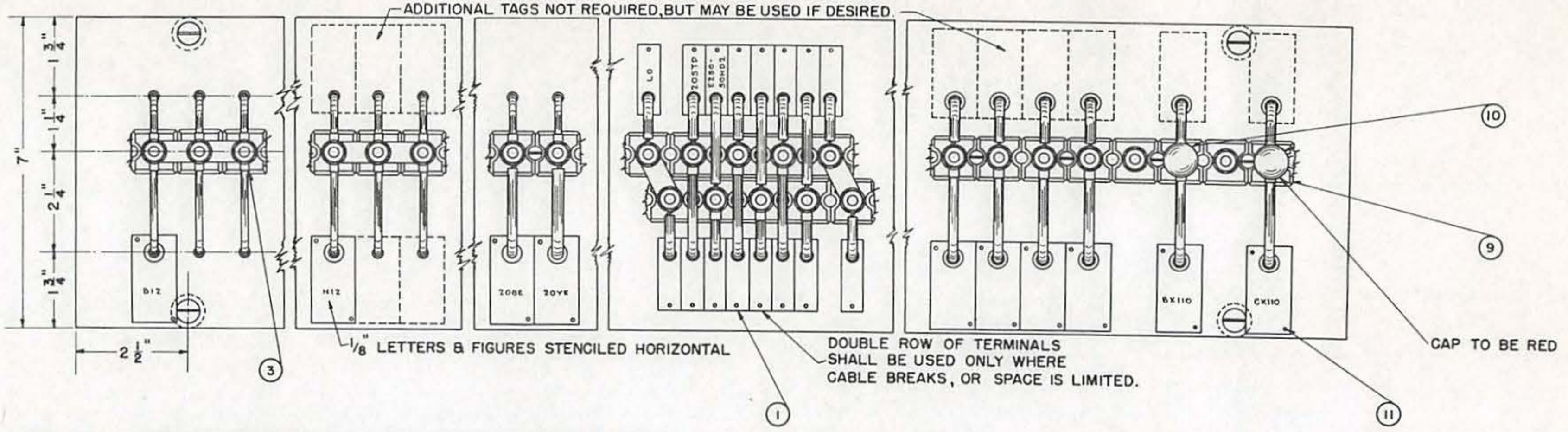
Made & Corrected 9-3-53
Approved: 1-12-54.
Revised: 9-26-56.
Revised: 6-2-58.

Sheet No. 8

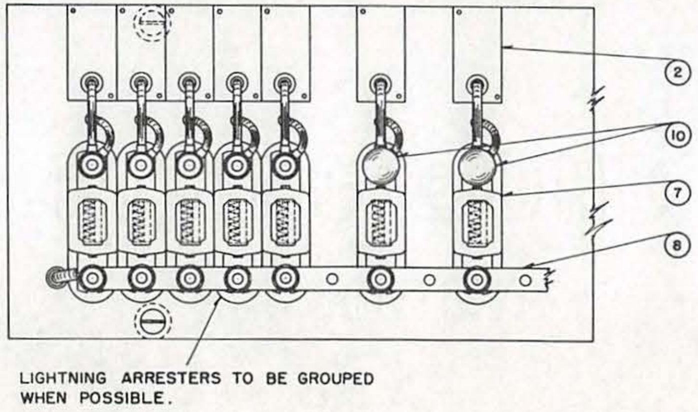
S-124-D


2 1/2"
3/4"
2 3/8"
1"
1/2"
"A"
"A"
DRILL THRU. 9/32" DIA. C'NT'BORE 11/16" DIA. X 5/16" DP. C'NT'SK. OPP. END TO ALLOW FLUSH SURFACE.
1/4" X 20 THD'S. X 4" F.H. STOVE BOLT.
SECTION "A-A"

VARIOUS ARRANGEMENT OF TERMINALS USED IN REAR PART OF RELAY CASE


ADDITIONAL TAGS NOT REQUIRED, BUT MAY BE USED IF DESIRED.
7"
1 3/4"
1 1/4"
2 1/4"
1 3/4"
2 1/2"
B12
N12
20BE
20YE
LO
20STP
E230-30HD2
BX110
CK110
③
1/8" LETTERS & FIGURES STENCILED HORIZONTAL
DOUBLE ROW OF TERMINALS SHALL BE USED ONLY WHERE CABLE BREAKS, OR SPACE IS LIMITED.
①
⑩
⑨
CAP TO BE RED
⑪

TYPICAL ARRANGEMENT OF LIGHTNING ARRESTERS


②
⑩
⑦
⑧
LIGHTNING ARRESTERS TO BE GROUPED WHEN POSSIBLE.

NOTE:

AERIAL CABLES & LINE WIRES SHALL BE TERMINATED BEHIND TOP SHELVES.

UNDERGROUND CABLES, AND WHERE PRACTICABLE, BATTERY BUSSES SHALL BE TERMINATED BEHIND BOTTOM SHELF.

NO MORE THAN TWO WIRES & ONE BUSS SHALL BE PLACED ON ANY ONE TERMINAL.

WOOD SCREWS TO BE BLUED R.H. NO.12 X 3/4" & 1-1/2" LONG.

SEE PLAN S-129, SH. 1 FOR DETAILS OF TERMINAL BOARDS.

TERMINALS AND ARRESTERS SHOULD NOT BE PLACED BEHIND DOOR JAMB IN 36-WAY RELAY CASE SHOWN ON STANDARD PLAN S-117.

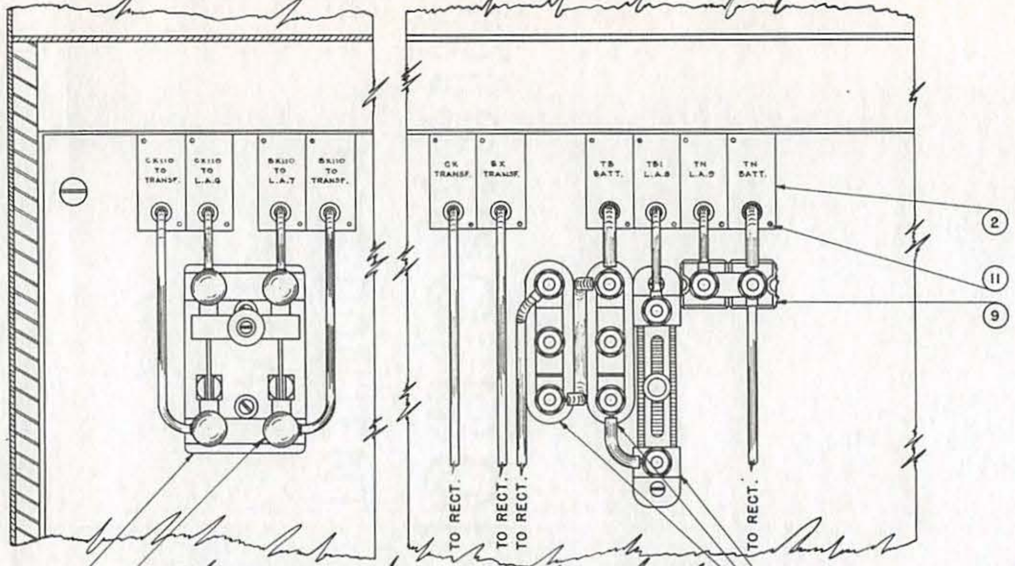
ADOPTED:- 2-5-47
REVISED 9-10-48 ACCOUNT POSITI[illegible] TOP SPACER CHANGED.
Revised: 1-16-50 account item numbers revised.
Revised: 5-16-51 account length of R.H. Wood Screws and Escutcheon Pins changed.

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

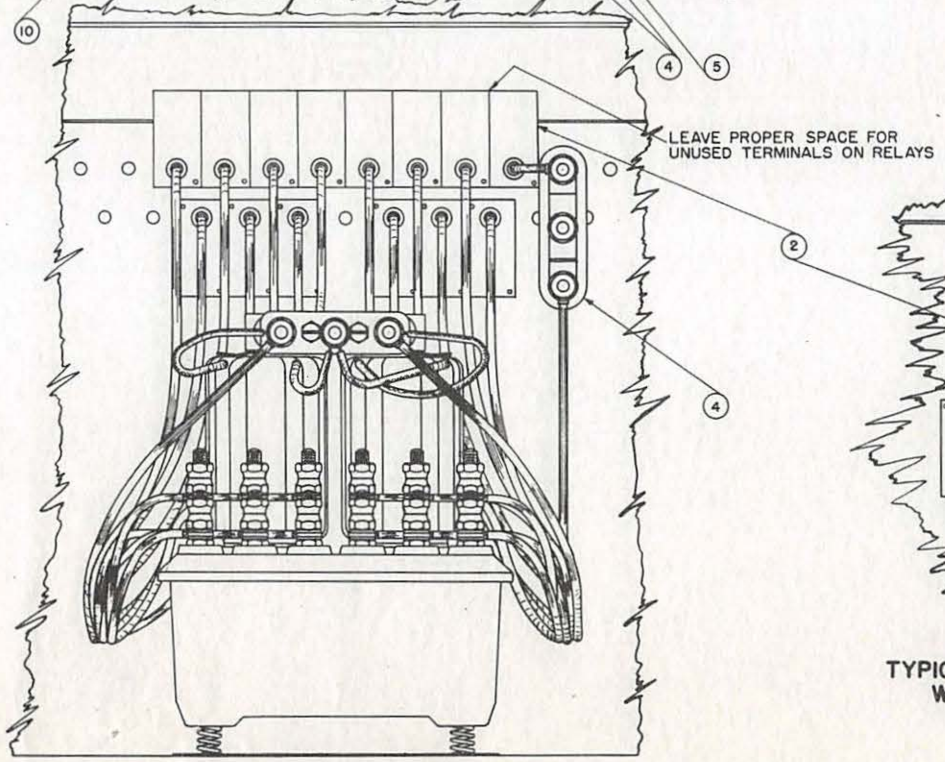
BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT
FOR STEEL RELAY CASES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 29, 1946

SHEET NO. 1
S-126-D

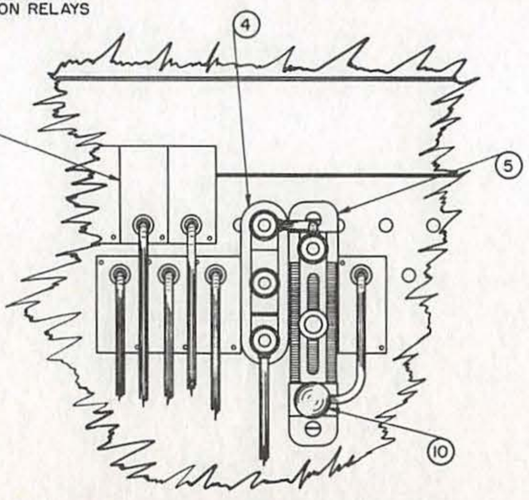
TYPICAL ARRANGEMENT OF KNIFE SWITCH, TEST TERMINALS, ETC. LOCATED IN FRONT OF STEEL CASE, BOTTOM SHELF


GK110 TO TRANSF.
GK110 TO L.A.G
BK110 TO L.A.T
BK110 TO TRANSF.
GK TRANSF.
BX TRANSF.
TB BATT.
TB1 L.A.B
TN L.A.B
TN BATT.
TO RECT.
TO RECT.
TO RECT.
TO RECT.
2
11
9
10
6
4
5

1- BLACK FIBRE TAG NO. 1371.
2- RED FIBRE TAG NO. 1372.
3- BEE WIRE TERMINAL (RACO NO. 530-1) NO. 1378.
4- CHILDERS-GRAHAM TEST SWITCH WITH PORCELAIN BASE NO. 1373.
5- G.R.S.CO. ADJUSTABLE RESISTOR NO. 46450-12 GR. 1.
6- DISCONNECTING SWITCH (G.R.S.CO. NO. 53615) NO. 1374.
7- RACO CLEARVIEW LIGHTNING ARRESTER NO. 485-2 COMPLETE WITH BASE.
8- BUS STRIP (HANLON & WILSON) NO. 1375.
9- TERMINAL BLOCK S-306 (A.A.R. 10542).
10- BLACK FIBRE SLEEVE NO. 1376-1 WITH RED BAKELITE CAP NO. 1376-2.
11- ESCUTCHEON PIN NO. 16 X 3/8" LONG NO. 1377.


LEAVE PROPER SPACE FOR UNUSED TERMINALS ON RELAYS
2
4

TYPICAL RELAY WIRING



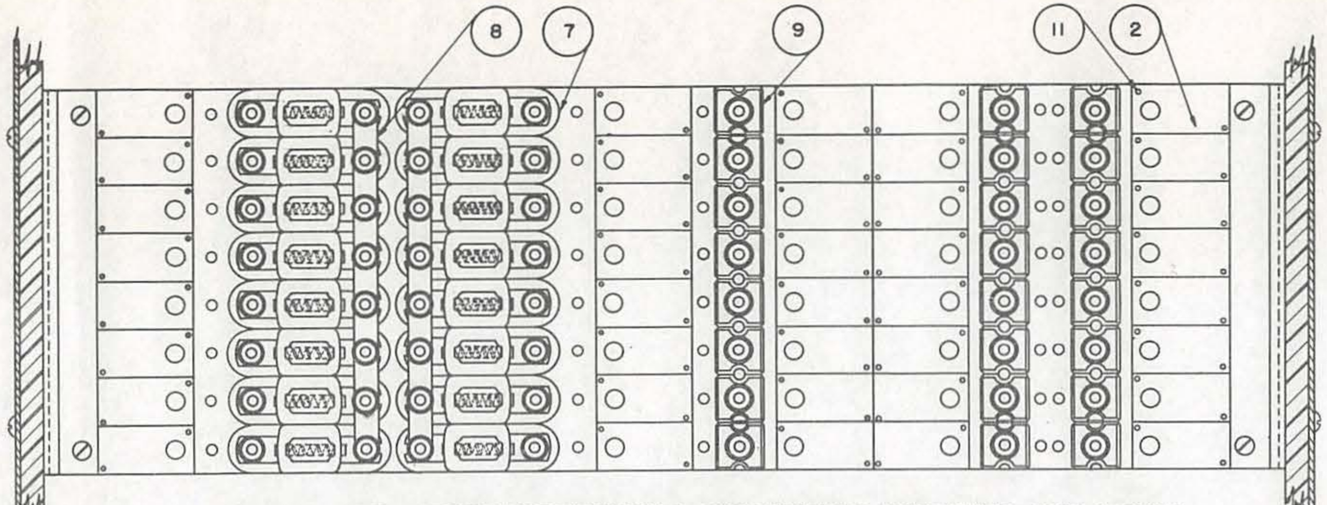
TYPICAL ARRANGEMENT TO BE USED WHEN RESISTOR IS REQUIRED

APPROVED: A H Hunt
CHIEF ENG'R. COMM. & SIGS.

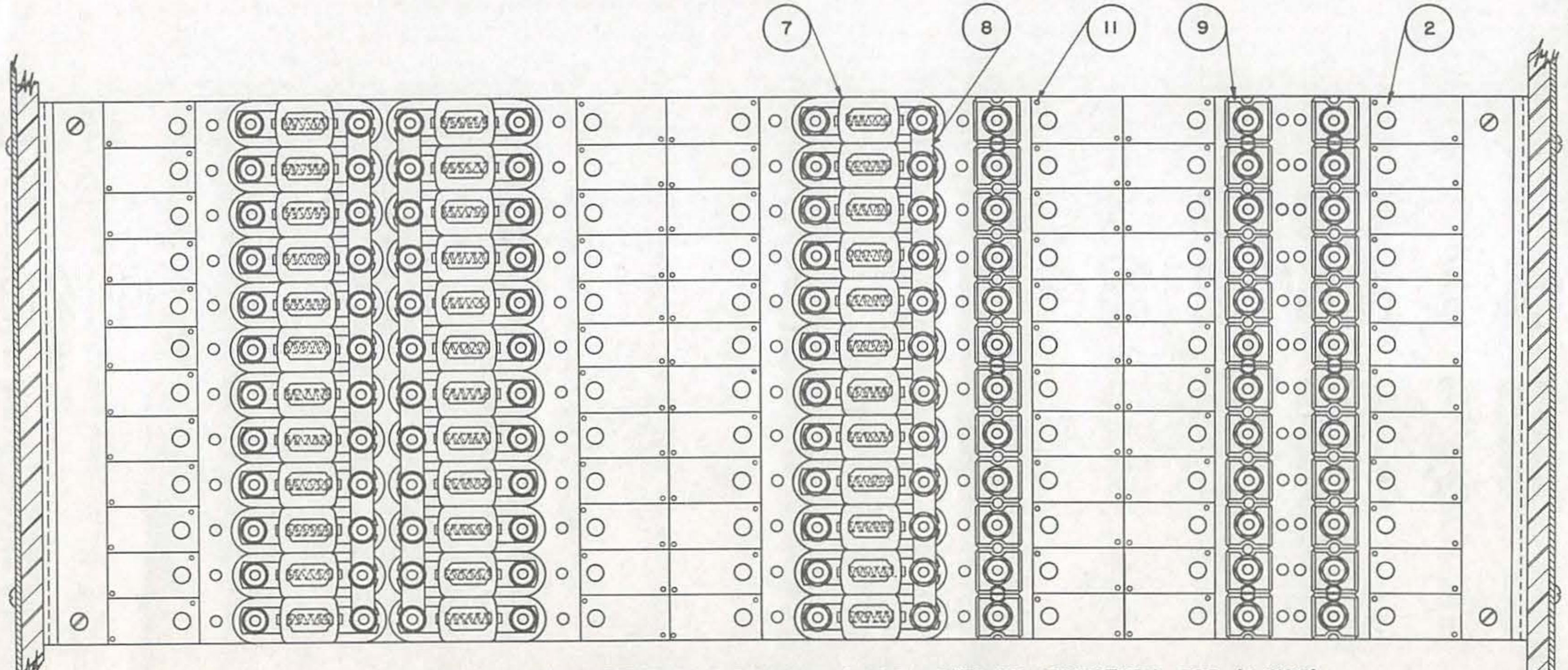
BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT FOR STEEL RELAY CASES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 31, 1946

SHEET NO. 2 S-126-D

ADOPTED:- 2-5-47
Revised - 1-16-50 account removal of fuses, adding test switch for relay, and item numbers revised.
Revised: 5-16-51 account length of R.H. Wood Screws and Escutchcon Pins changed.



TYPICAL ARRANGEMENT OF TERMINALS AND LIGHTNING ARRESTERS FOR (3 WAY) RELAY CASE G.R.S. 54311-97, GR.I



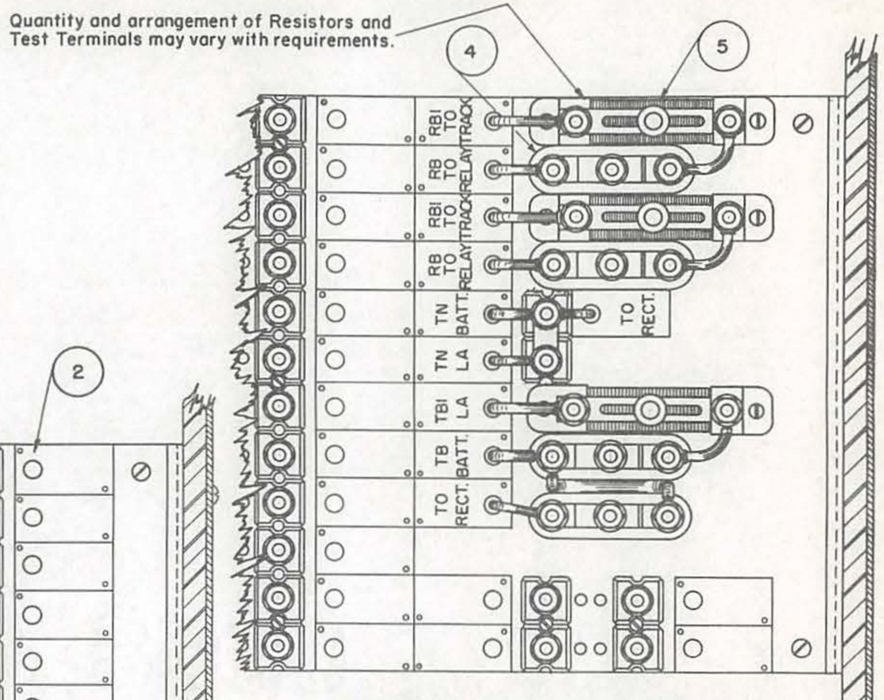
TYPICAL ARRANGEMENT OF TERMINALS AND LIGHTNING ARRESTERS FOR (6 WAY) RELAY CASE G.R.S. 54311-96, GR.I.

NOTE:

TERMINALS & LIGHTNING ARRESTERS SHALL BE LIMITED TO ACTUAL QUANTITY REQUIRED.

SEE PLAN S-126, SH. 2 FOR ITEM IDENTIFICATION.

SEE PLAN S-129, SH. 2 FOR DETAILS OF TERMINAL BOARDS.


Quantity and arrangement of Resistors and Test Terminals may vary with requirements.
4
5
RBI TO TRACK
RB TO RELAY
RBI TO TRACK
RB TO RELAY
TN BATT.
TO RECT.
TN LA
TBI LA
TB BATT.
TO RECT.

SECTION SHOWING ARRANGEMENT OF RESISTORS AND TEST SWITCHES

APPROVED: C A Hunt
CHIEF ENG'R. COMM. & SIGS.

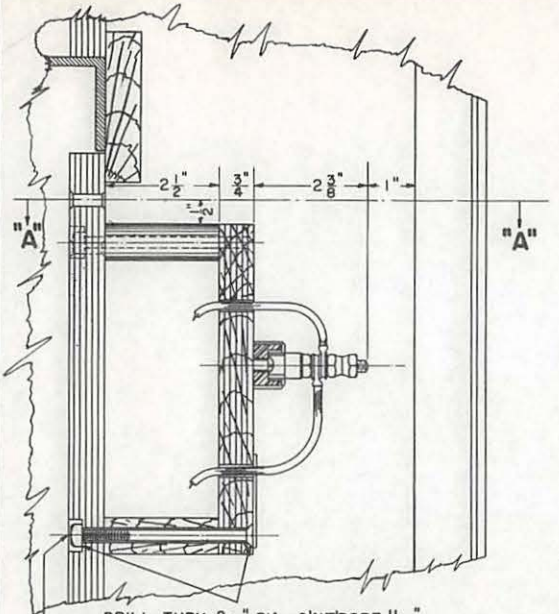
BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT FOR STEEL RELAY CASES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 9, 1948

Revised: 1-16-50 account showing Test Switches & Resistors.

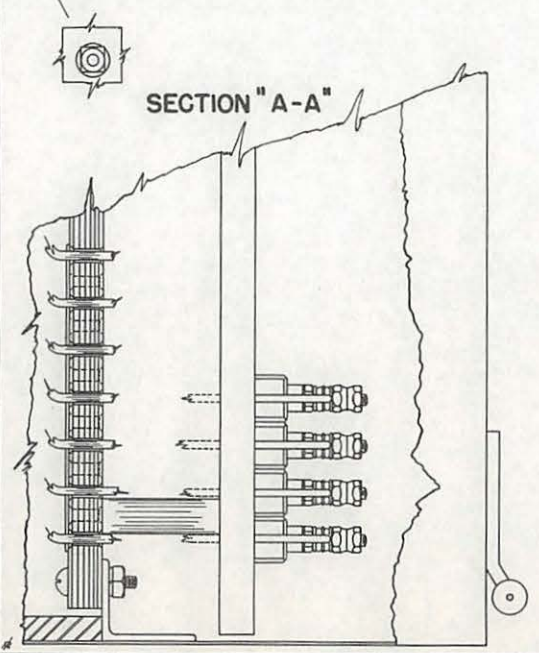
Test terminals and resistor for rectifier moved to terminal board. 2-26-52.

SHEET NO. 3

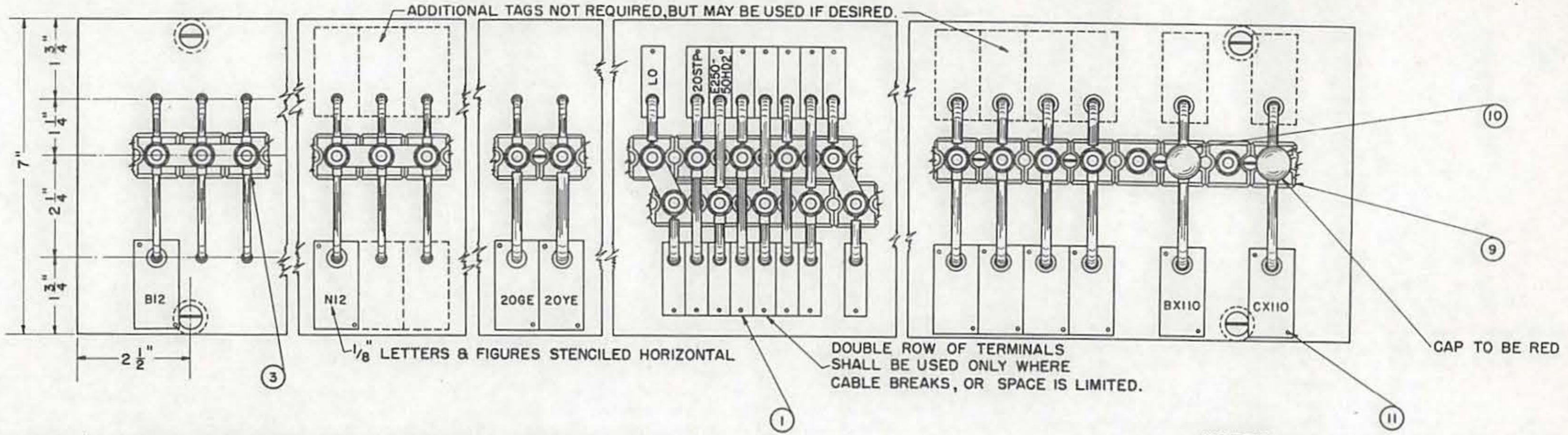
S-126-D


2 1/2"
3/4"
2 3/8"
1"
1/2
"A"
"A"

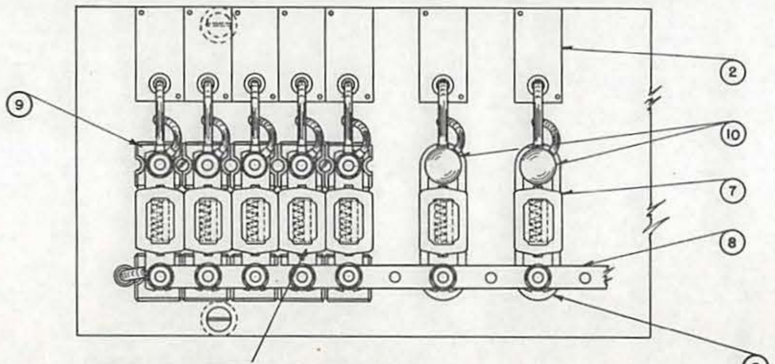
DRILL THRU. 9/32" DIA. C'NT'BORE 11/16" DIA. X 5/16" DP. C'NT'SK. OPP. END TO ALLOW FLUSH SURFACE.
1/4" X 20 THD'S. X 4" F.H. STOVE BOLT.


SECTION "A-A"

VARIOUS ARRANGEMENT OF TERMINALS USED IN REAR PART OF RELAY HOUSING


ADDITIONAL TAGS NOT REQUIRED, BUT MAY BE USED IF DESIRED.
1 3/4"
1 1/4"
7"
2 1/4"
1 3/4"
2 1/2"
B12
N12
20GE
20YE
LO
20STP
E250-
50HD2
BX110
CX110
1/8" LETTERS & FIGURES STENCILED HORIZONTAL
DOUBLE ROW OF TERMINALS SHALL BE USED ONLY WHERE CABLE BREAKS, OR SPACE IS LIMITED.
CAP TO BE RED
③
①
⑨
⑩
⑪

TYPICAL ARRANGEMENT OF LIGHTNING ARRESTERS



LIGHTNING ARRESTERS TO BE GROUPED WHEN POSSIBLE.

NOTES:

Aerial Cables & Line Wires shall be terminated behind top shelves.

Underground Cables, and where practicable, Battery Busses shall be terminated behind bottom shelf.

No more than Two Wires & One Buss shall be placed on any one terminal.

Wood Screws to be Blued R.H. No. 12 X 3/4" & 1-1/2" lg.

See Standard Plan S-129-B, sh. 1 for details of Terminal Boards.

Terminals and Arresters should not be placed behind door jamb in 36 way relay case shown on Standard Plan S-117-E.

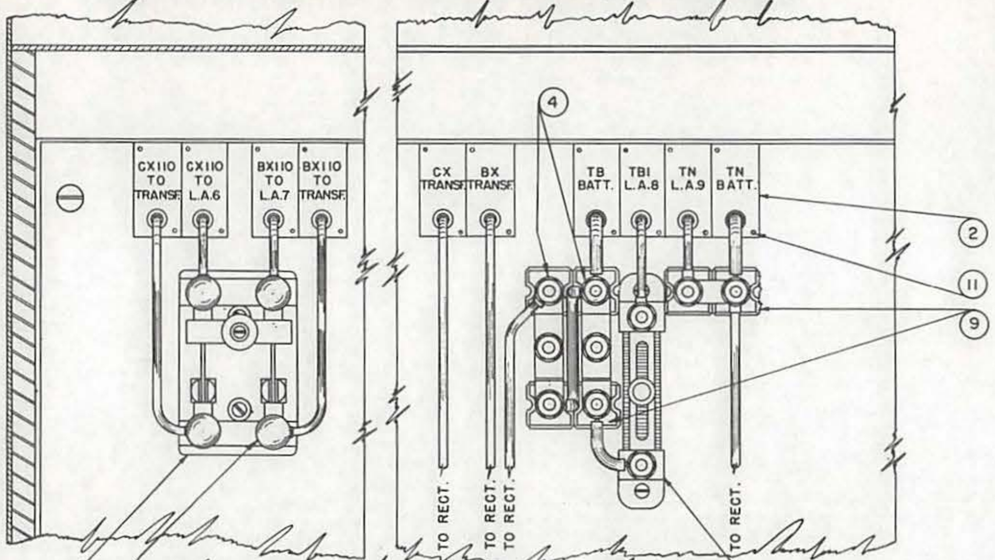
Approved: A L Jordan
Signal Engineer

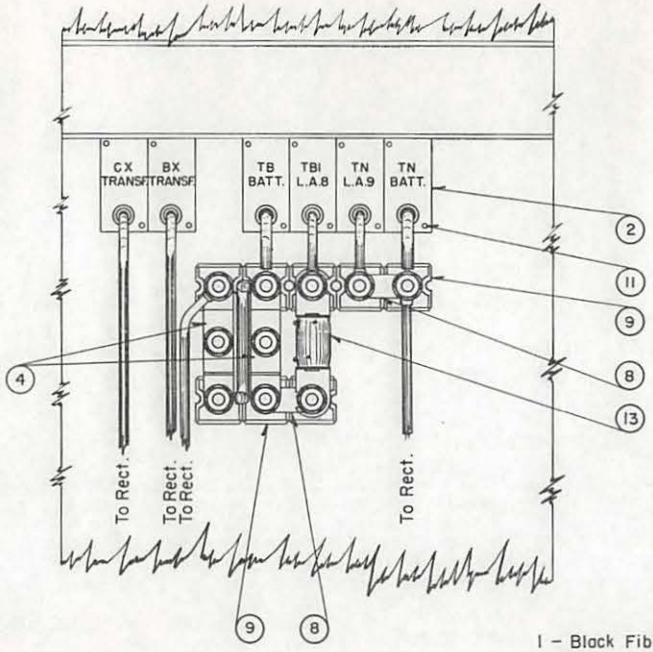
BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT
FOR STEEL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
July 7, 1958

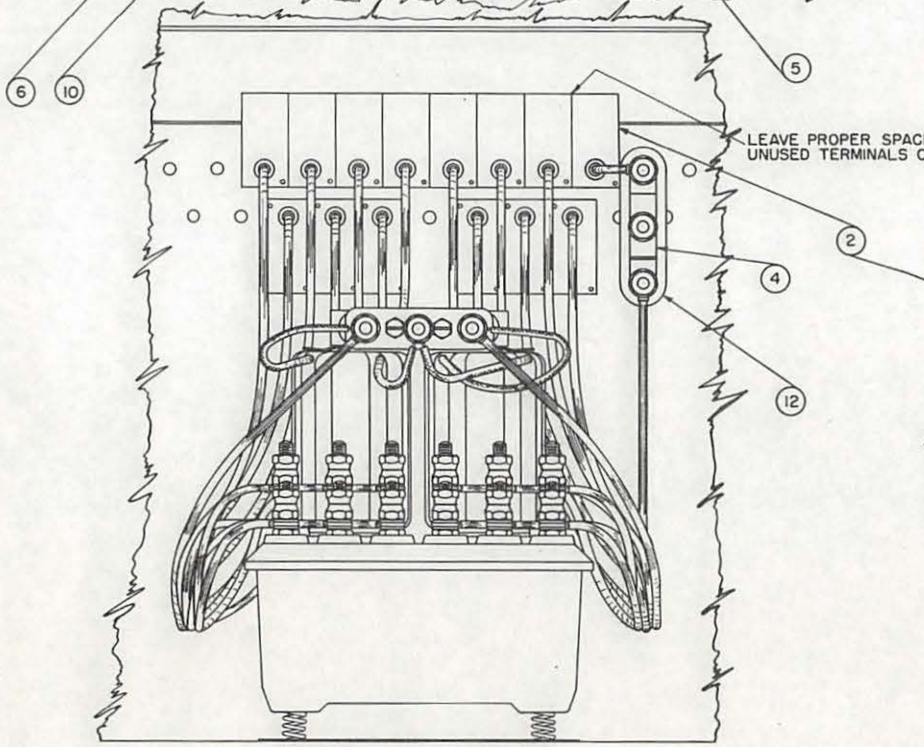
SHEET NO. 1
S-126-F

Made & Corrected 10-31-46
Adopted: 2-5-47.
Revised: 9-10-48 account position of Top Spacer changed.
Revised: 1-16-50 account item numbers revised.
Revised: 5-16-51 account length of R.H. Wood Screw and Escutcheon Pins changed.
Revised: 7-1-53 account Terminals for Lightning Arresters changed.
Revised: 7-15-58

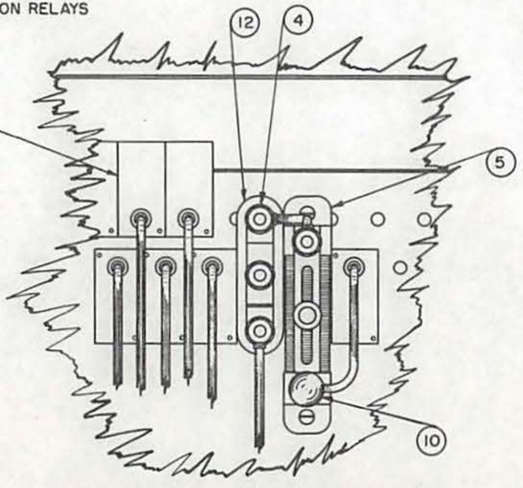
TYPICAL ARRANGEMENT OF KNIFE SWITCH, TEST TERMINALS, ETC. LOCATED IN FRONT OF STEEL HOUSING, BOTTOM SHELF


CX110 TO TRANSF.
CX110 TO L.A.6
BX110 TO L.A.7
BX110 TO TRANSF.
CX TRANSF.
BX TRANSF.
TB BATT.
TBI L.A.8
TN L.A.9
TN BATT.
TO RECT.
TO RECT.
TO RECT.
TO RECT.
4
2
11
9


CX TRANSF.
BX TRANSF.
TB BATT.
TBI L.A.8
TN L.A.9
TN BATT.
To Rect.
To Rect.
To Rect.
To Rect.
2
11
9
8
13
4
9
8


6
10
5
LEAVE PROPER SPACE FOR UNUSED TERMINALS ON RELAYS
2
4
12

TYPICAL RELAY WIRING



TYPICAL ARRANGEMENT TO BE USED WHEN RESISTOR IS REQUIRED

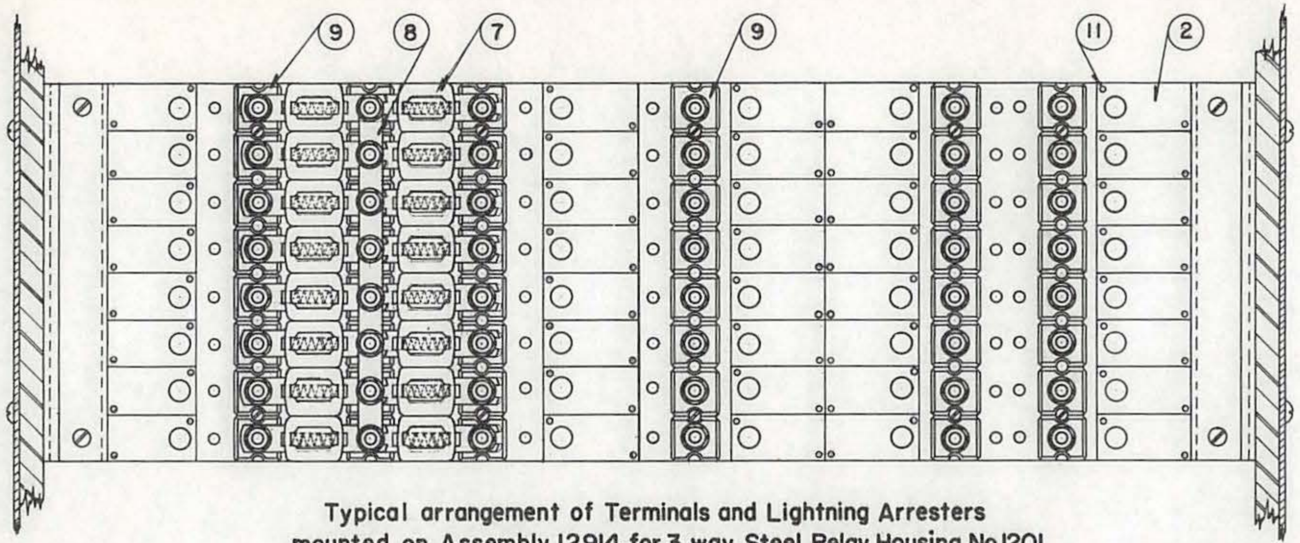
1 - Black Fibre Tag No. **1371**
2 - Black Fibre Tag No. **1372**
3 - Wire Terminal, Standard Plan **S-137-H**
4 - Childers-Graham Test Switch only No. **1373**
5 - G.R.S. Co. Adjustable Resistor No. 46450-12, Gr. I.
6 - Disconnecting Switch (G.R.S. Co. No. 53615) No. **1374**
7 - Lightning Arrester
8 - Bus Strip (Hanlon & Wilson) No. **1375**
9 - Multiple Unit Terminal Block Assembly (AAR 10545), Standard Plan **S-306-D**
10 - Black Fibre Sleeve No. **1376-1** with Red Bakelite Cap No. **1376-2**
11 - Escutcheon Pin No. 16 X 3/8" long, No. **1377**
12 - Terminal Block Assembly, AAR 105615, Standard Plan **S-307-F**
13 2 Ohm Fixed Resistor Unit

Approved: A. L. Jordan
Signal Engineer

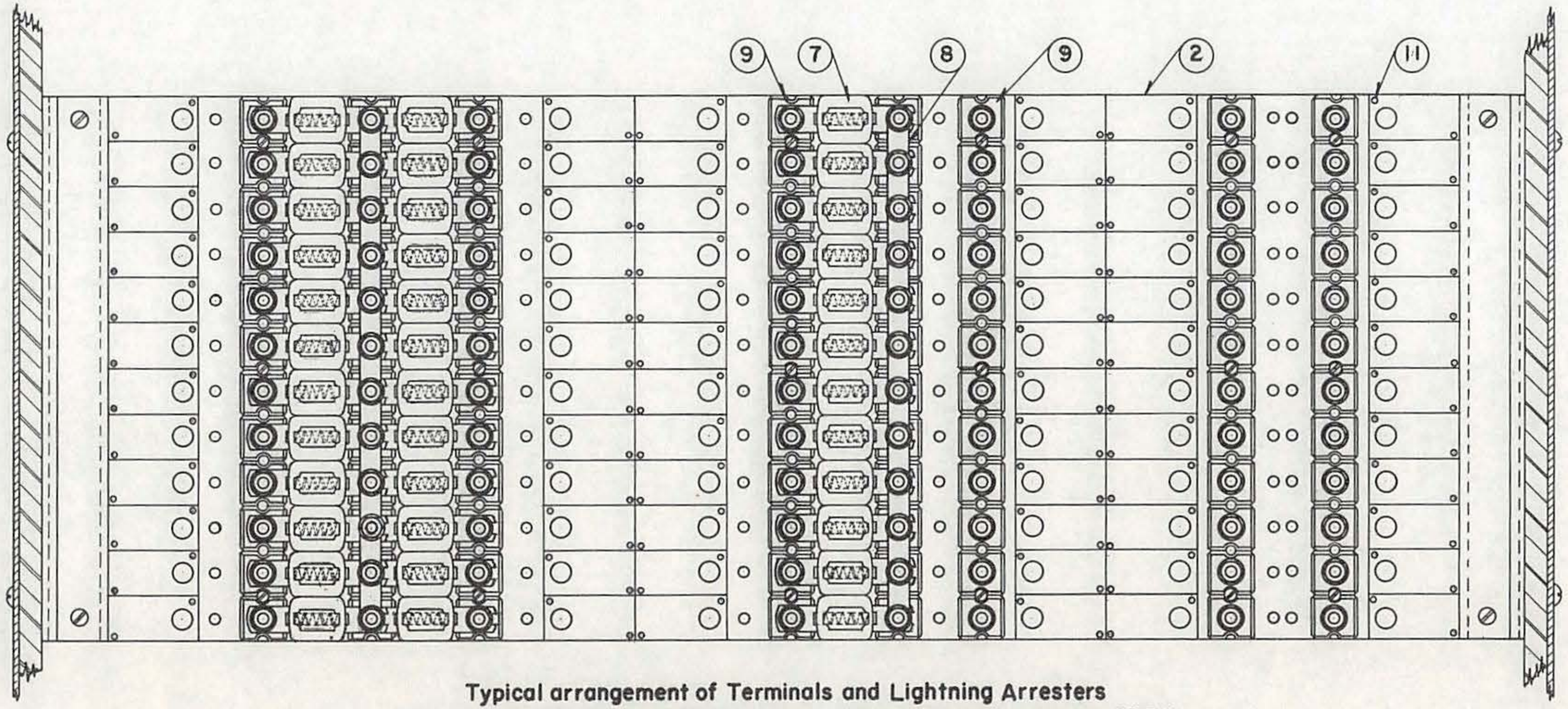
BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT FOR STEEL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
July 7, 1958

Made & Corrected 10-31-46
Adopted 2-5-47
Revised 1-16-50 account removal of fuses, adding test switch for relay, and item numbers revised.
Revised 5-16-51 account length of R.H. Wood Screws and Escutcheon Pins changed.
Revised 7-1-53 account Terminals for Lightning Arrester changed.
Revised 7-15-58 showing additional use of multiple terminals.

SHEET NO. 2
S-126-F

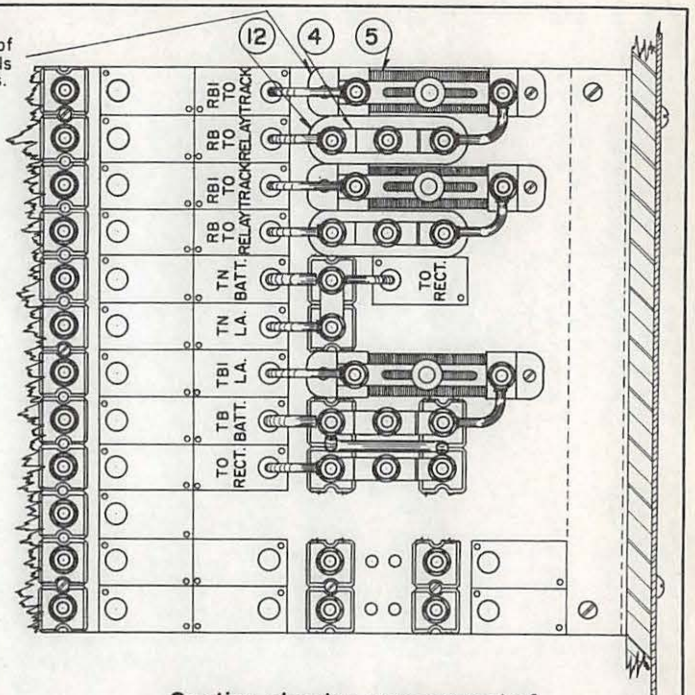


Typical arrangement of Terminals and Lightning Arresters mounted on Assembly 12914 for 3 way Steel Relay Housing No.1201



Typical arrangement of Terminals and Lightning Arresters mounted on Assembly 12915 for 6 way Steel Relay Housing No.1202

Quantity and arrangement of Resistors and Test Terminals may vary with requirements.


12
4
5
RBI TO TRACK
RB TO RELAY
RBI TO TRACK
RB TO RELAY
TN BATT.
TO RECT.
TN L.A.
TBI L.A.
TB BATT.
TO RECT.

Section showing arrangement of Resistors and Test Switches

Notes:

Terminals & Lightning Arresters shall be limited to actual quantity required

See Standard Plan S-126-F, sh. 2 for item identification.

See Standard Plan S-129-B, sh. 2 for details of Terminal Boards.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
TERMINAL ARRANGEMENT
FOR STEEL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
July 7, 1958

Sheet No. 3 S-126-F

-7-58 : New plan made.

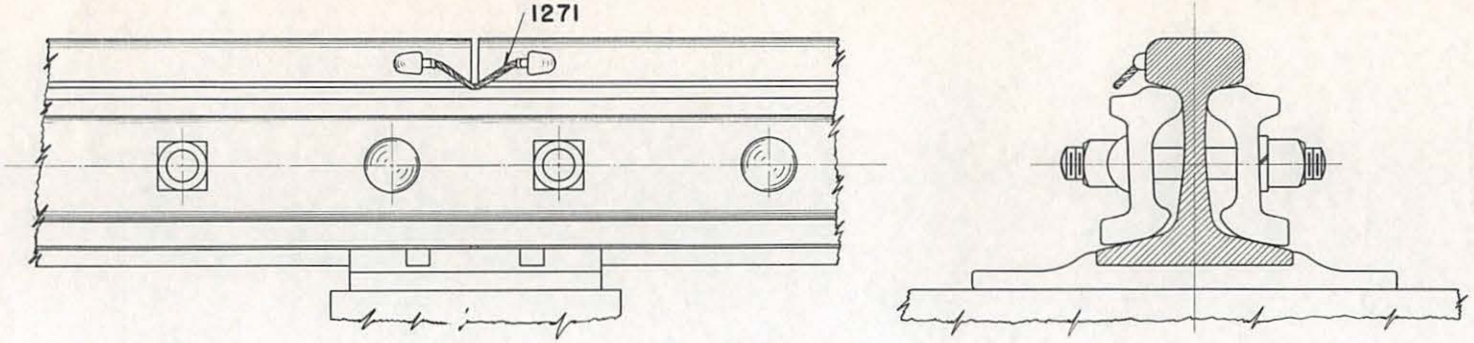


FIG. 1

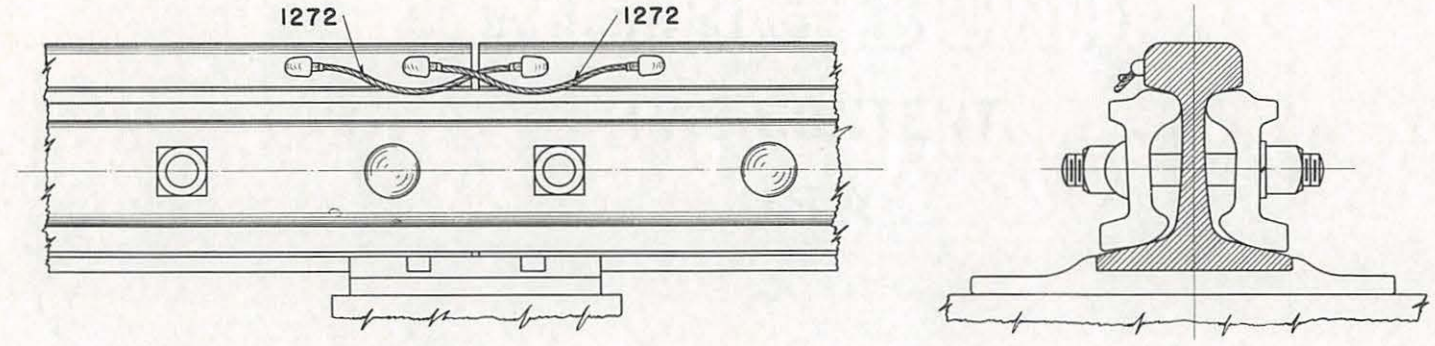


FIG. 2

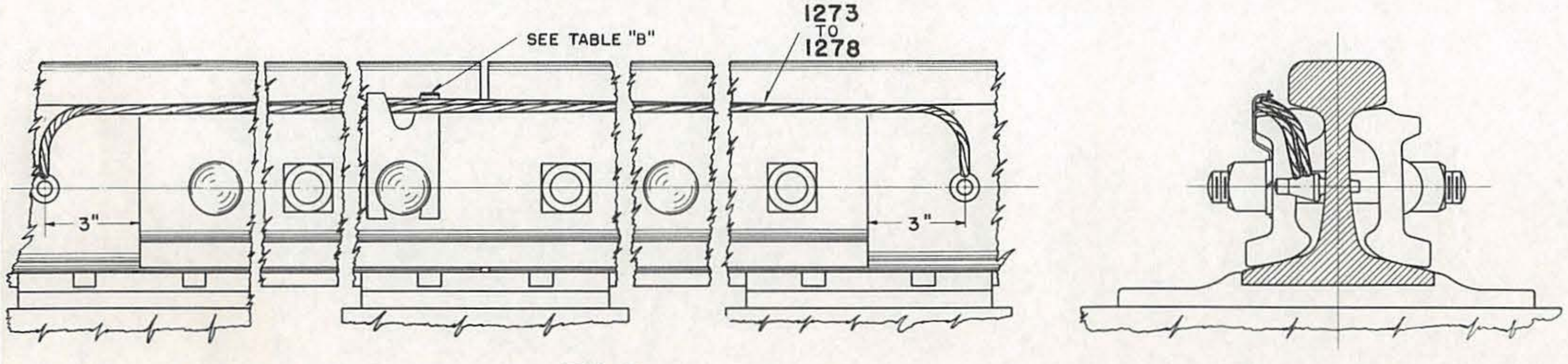


FIG. 3

TABLE - A : USAGE	
FIG.- 1	FOR GENERAL USE WHERE RAIL & WEATHER CONDITION PERMITS. INSTALL AS PER INSTRUCTIONS. I-122
FIG.- 2	IN TUNNELS, STATION PLATFORMS, ROAD CROSSINGS AND FOULING CIRCUITS.
FIG.- 3	OTHER APPLICATIONS.

TABLE - B

RAIL SECTION	DRAWING NO. OF ANGLE BAR	PROTECTOR NUMBER
100 RA	25572	104
100 RB	27082	106
100RB	25573 & 16789	127
100RB	24551	128
130REHF	27083	167
130RE	25574 & 21599	177
130 AREA	24552	177
112RE	35339	176
131RE	35341	176
115RE	36621	163-A
140PS	36622	195.

NOTE:
COPPER-COVERED STEEL BONDS AND CONNECTORS MAY BE USED AT LOCATIONS WHERE THE USE OF NO-OX-ID "A" SPECIAL, IS INSUFFICIENT TO PREVENT CORROSION.

APPROVED: CHIEF ENG'R. MAINTENANCE

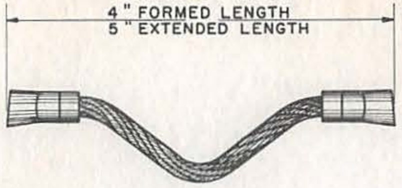
APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
BONDS FOR RAIL JOINTS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 20, 1947

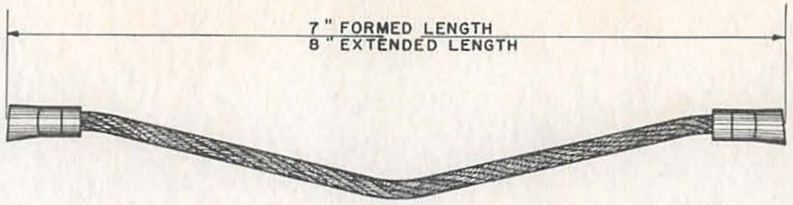
ADOPTED: 5-27-47
REVISED: 4-11-49 - DETAILS OF BONDS
MADE SHEET 2. FILE NO. CHANGED
FROM S-138 TO S-127.
FIG. 2, TABLE A, REVISED 12-13-51.

SHEET NO. 1

S-127-B


4" FORMED LENGTH
5" EXTENDED LENGTH

BOND - 1271
CADWELD NO. 20102

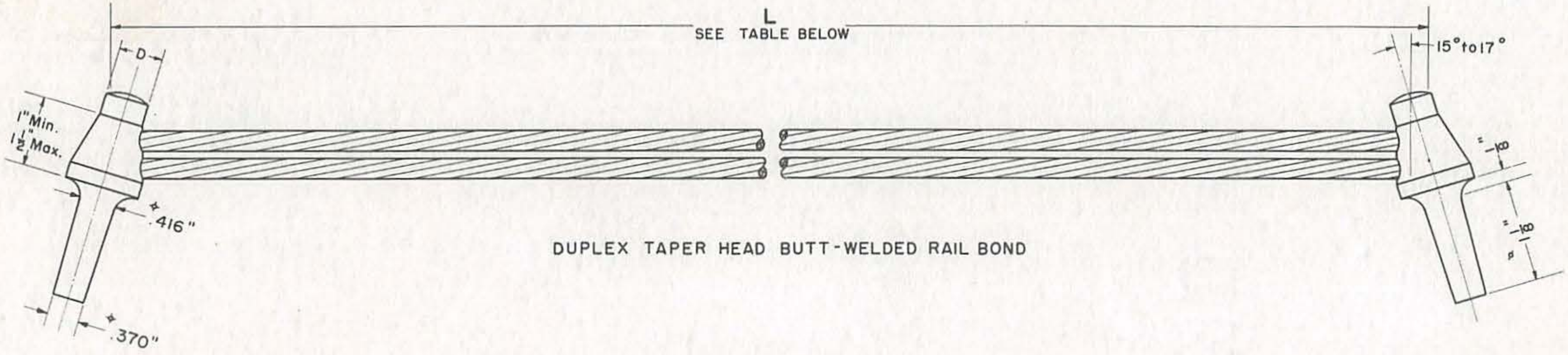

7" FORMED LENGTH
8" EXTENDED LENGTH

BOND - 1272
CADWELD NO. 20118

NOTES:

1- Unless otherwise specified wires in strand shall be annealed.

2- Where the use of NO-OX-ID grease is insufficient to prevent corrosion each bond strand shall consist of 7-40% copper covered steel wires.


L
SEE TABLE BELOW
D
1" Min.
1½" Max.
✧.416"
✧.370"
15° to 17°
1/8"
1/8"

DUPLEX TAPER HEAD BUTT-WELDED RAIL BOND

TOLERANCES

✧ = .004" UNDER : .001 OVER
⚐ = .006" UNDER OR OVER
D = $\frac{1}{2}$" Min. $\frac{3}{4}$" Max.

BOND NO.	L	CONDUCTOR-WIRES IN EACH STRAND	DIAMETER		LENGTH OF STRAND LAY
			EACH WIRE	EACH STRAND	
1273	37"	1 ANNEALED COPPER, 6 GALVANIZED STEEL, BUTT-WELDED	.077"	.231"	2.54"
1274	46"	" " " " " " " "	.077"	.231"	2.54"
1275	37"	2 ANNEALED COPPER, 5 GALVANIZED STEEL, BUTT-WELDED	.077"	.231"	2.54"
1276	46"	" " " " " " " "	.077"	.231"	2.54"
1277	37"	7-40% COPPER COVERED STEEL, BUTT-WELDED	.081"	.243"	2.75"
1278	46"	" " " " " " "	.081"	.243"	2.75"

MATERIAL SHALL BE IN ACCORDANCE WITH
A.A.R. SIGNAL SECTION SPECIFICATION 151.

APPROVED: ______
CHIEF ENG'R. MAINTENANCE

APPROVED: ______
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
BONDS FOR RAIL JOINTS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 16, 1949

Revised 10-15-50 account 1272 and
Duplex bond revised account A.A.R. c.151.

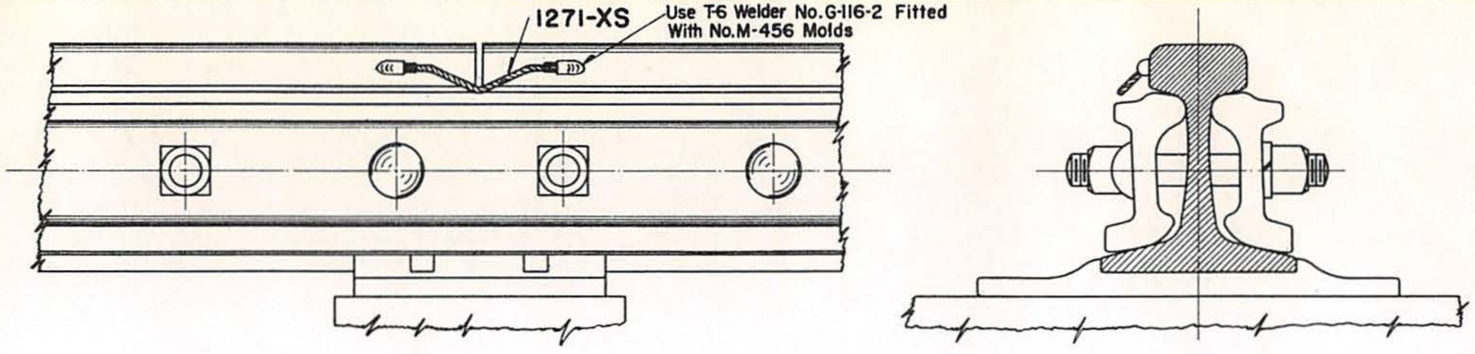

1271-XS
Use T-6 Welder No. G-116-2 Fitted With No. M-456 Molds

FIG. 1

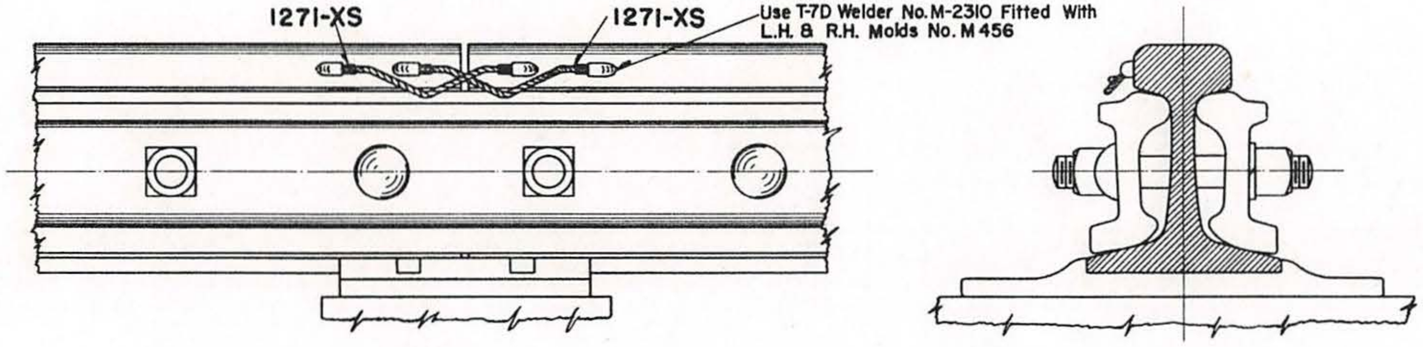

1271-XS
1271-XS
Use T-7D Welder No. M-2310 Fitted With L.H. & R.H. Molds No. M 456

FIG. 2

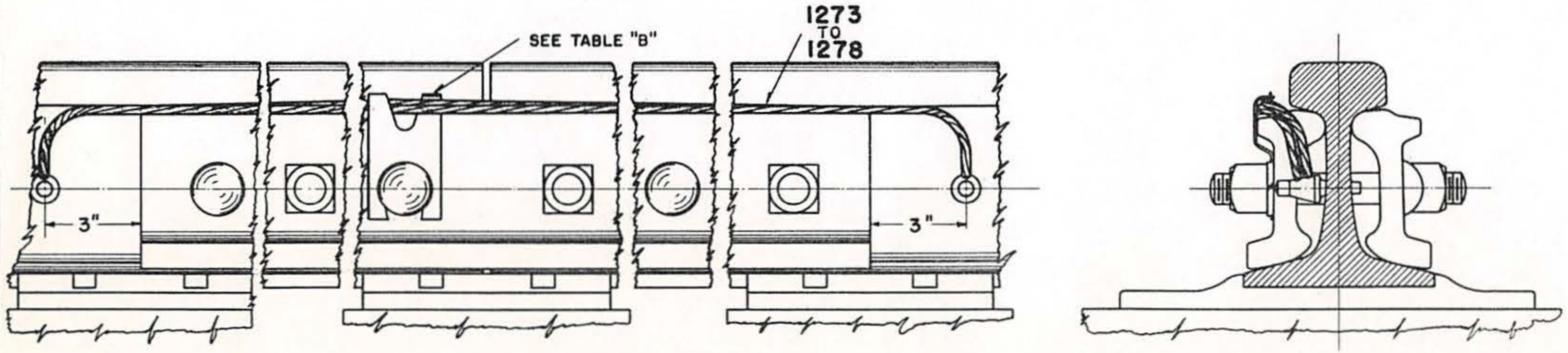

SEE TABLE "B"
1273 TO 1278
3"
3"

FIG. 3

TABLE - A : USAGE	
FIG.-1	FOR GENERAL USE WHERE RAIL & WEATHER CONDITION PERMITS. INSTALL AS PER CURRENT INSTRUCTIONS I-122.
FIG.-2	FOR STATION PLATFORMS, ROAD CROSSINGS AND FOULING CIRCUITS.
FIG.-3	OTHER APPLICATIONS.

TABLE - B

RAIL SECTION	DRAWING NO. OF ANGLE BAR	PROTECTOR NUMBER
100 RA	25572	104
100 RB	27082	106
100RB	25573 & 16789	127
100RB	24551	128
130REHF	27083	167
130RE	25574 & 21599	177
130 AREA	24552	177
112RE	35339	176
131RE	35341	176
115RE	36621	163-A
140PS	36622	195

NOTE:
COPPER-COVERED STEEL BONDS AND CONNECTORS MAY BE USED AT LOCATIONS WHERE THE USE OF NO-OX-ID "A" SPECIAL, IS INSUFFICIENT TO PREVENT CORROSION.

Approved : J.A. Conwood
Chief Engineer

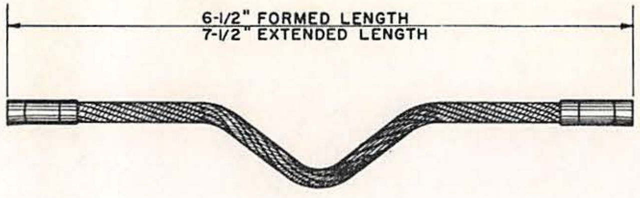
Approved : A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
BONDS FOR RAIL JOINTS
Office of Signal Engineer
Baltimore, Md.
Sept. 26, 1963

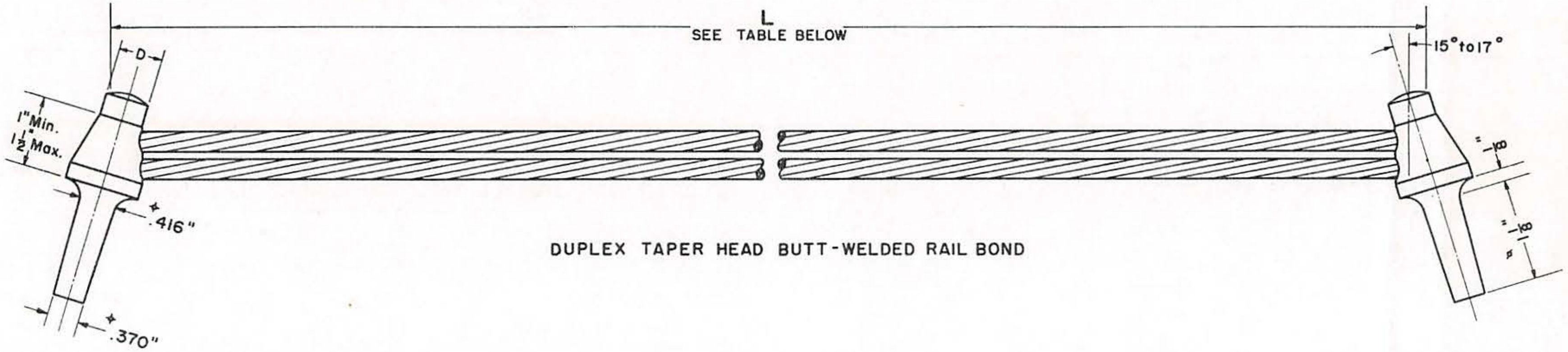
Sheet No. 1

S-127-D

Adopted : 5-27-47.
Revised 4-11-49 : Details of Bonds made sheet 2.
File No. changed from S-138 to S-127.
Revised 12-13-51 : Fig. 2, Table A.
10-29-62: Usage Table-A "In Tunnels" removed from Fig. 2.
10-25-63: Bonds 1271 & 1273 removed, Bond 1271-XS made 6-1/2".



BOND-1271-XS
Erico Products Co. No. S-2488-2



DUPLEX TAPER HEAD BUTT-WELDED RAIL BOND

NOTES:

1- Unless otherwise specified wires in strand shall be annealed.
2- Where the use of NO-OX-ID grease is insufficient to prevent corrosion each bond strand shall consist of 7-40% copper covered steel wires.

TOLERANCES
✦ = .004" UNDER : .001 OVER
♮ = .006" UNDER OR OVER
D = ½" Min. ¾" Max.

BOND NO.	L	CONDUCTOR-WIRES IN EACH STRAND	DIAMETER		LENGTH OF STRAND LAY
			EACH WIRE	EACH STRAND	
1273	38"	1 ANNEALED COPPER, 6 GALVANIZED STEEL, BUTT-WELDED	.077"	.231"	2.54"
1274	46"	" " " " " " " "	.077"	.231"	2.54"
1277	38"	7-40% COPPER COVERED STEEL, BUTT-WELDED	.081"	.243"	2.75"
1278	46"	" " " " " " "	.081"	.243"	2.75"

MATERIAL SHALL BE IN ACCORDANCE WITH
A.A.R. SIGNAL SECTION SPECIFICATION 151.

Approved : J. A. Caywood
Chief Engineer

Approved : A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
BONDS FOR RAIL JOINTS
Office of Signal Engineer
Baltimore, Md.
Sept. 25, 1963

Revised 10-16-50: Bond 1272 changed and Duplex bond revised account A.A.R. Spec. 151.
Revised 2-2-56: Bond 1275 and 1276 removed.
Revised 9-25-63: Bonds 1271 & 1272 removed, Bond 1271-XS made 6-1/2".

Sheet No. 2

S-127-D

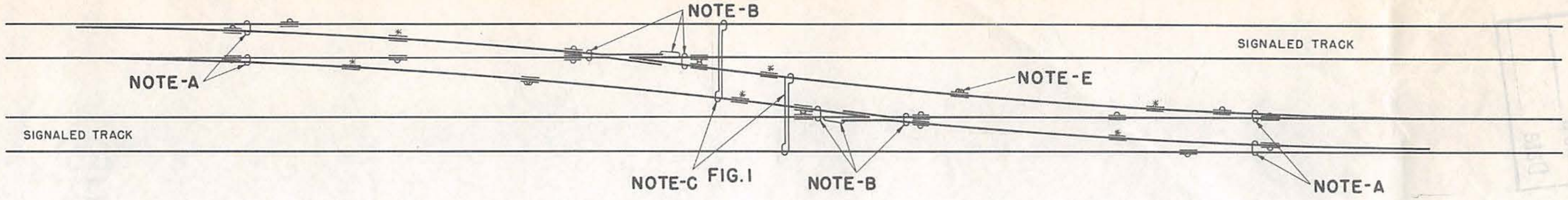

NOTE-B
NOTE-A
SIGNALED TRACK
NOTE-E
SIGNALED TRACK
NOTE-C
NOTE-B
NOTE-A

FIG. 1

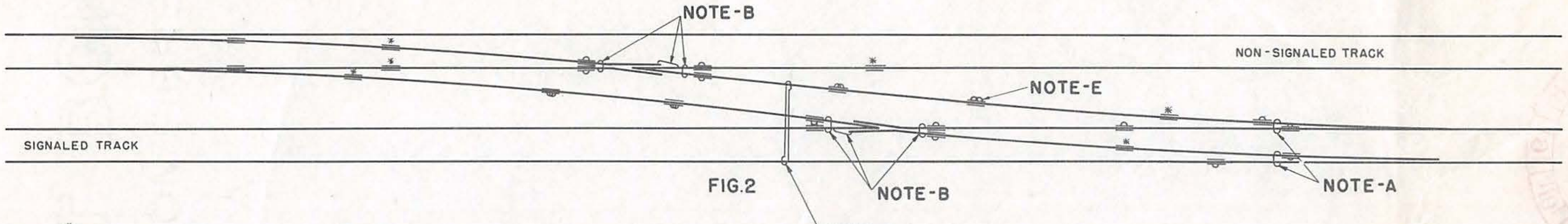

NOTE-B
NON-SIGNALED TRACK
NOTE-E
SIGNALED TRACK
NOTE-B
NOTE-A

FIG. 2

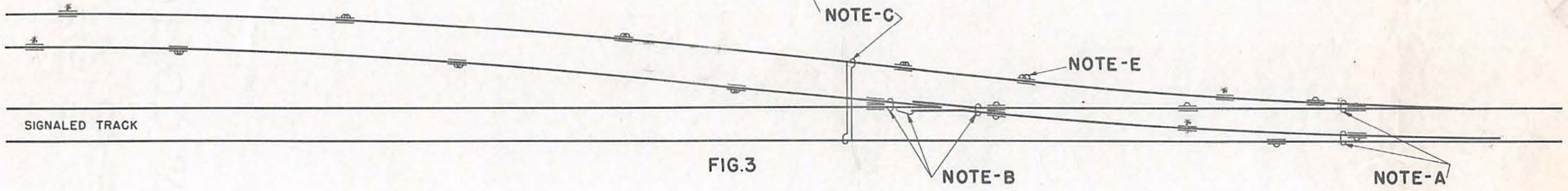

NOTE-C
NOTE-E
SIGNALED TRACK
NOTE-B
NOTE-A

FIG. 3

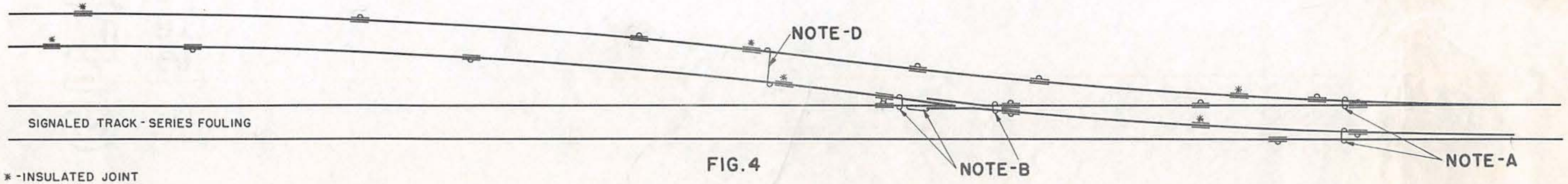

NOTE-D
SIGNALED TRACK - SERIES FOULING
NOTE-B
NOTE-A

FIG. 4

* -INSULATED JOINT

NOTE A - FOR DETAILS OF DUPLEX BOND SEE PLAN S-128, SHEET 3.
NOTE B - FOR DETAILS OF DUPLEX BONDS SEE PLAN S-128, SHEET 2.
NOTE C - FOR DETAILS OF FOULING BOND SEE PLAN S-128, SHEET 3.
NOTE D - FOR DETAILS OF TRANSPOSITION BOND SEE PLAN S-128, SHEET 3.
NOTE E - FOR DETAILS OF DOUBLE BONDING SEE PLAN S-127, SHEET 1.

APPROVED: C B Harris
CHIEF ENG'R. MAINTENANCE

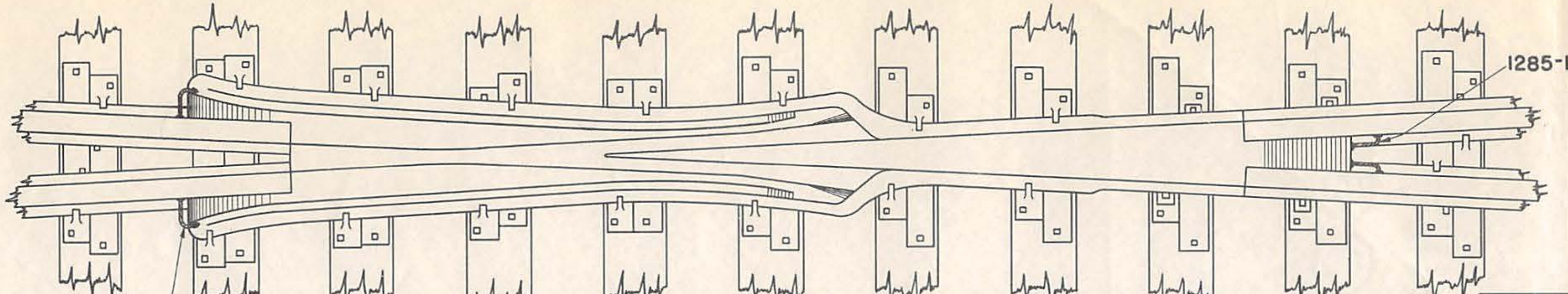
APPROVED: A S Hauer
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 29, 1946

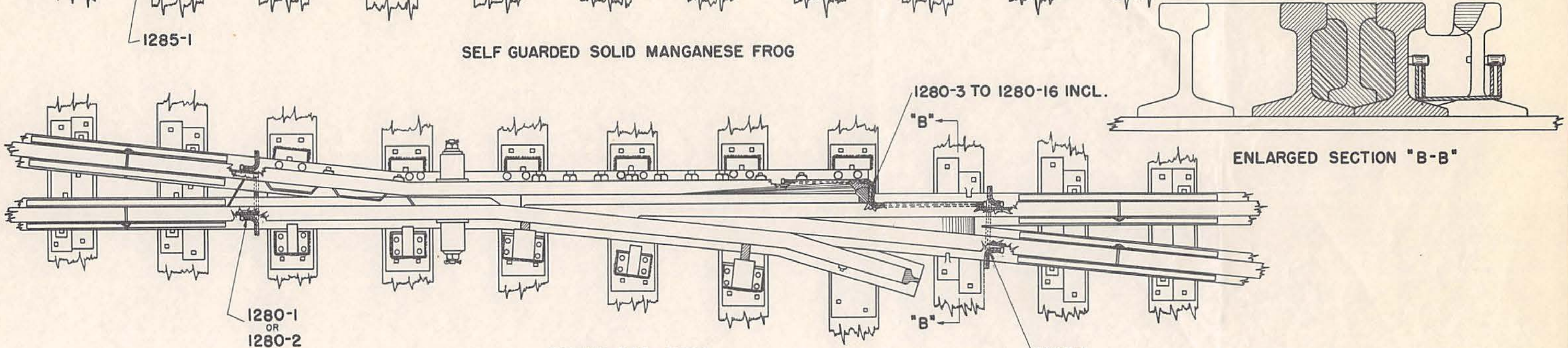
SHEET NO. 1 S-128

RECEIVED
JUN 21 1949
SPECIFICATION DEPT.

RECEIVED
MAILING DEPT.
JUN 20 1949
A.M.
Ans'd
Date

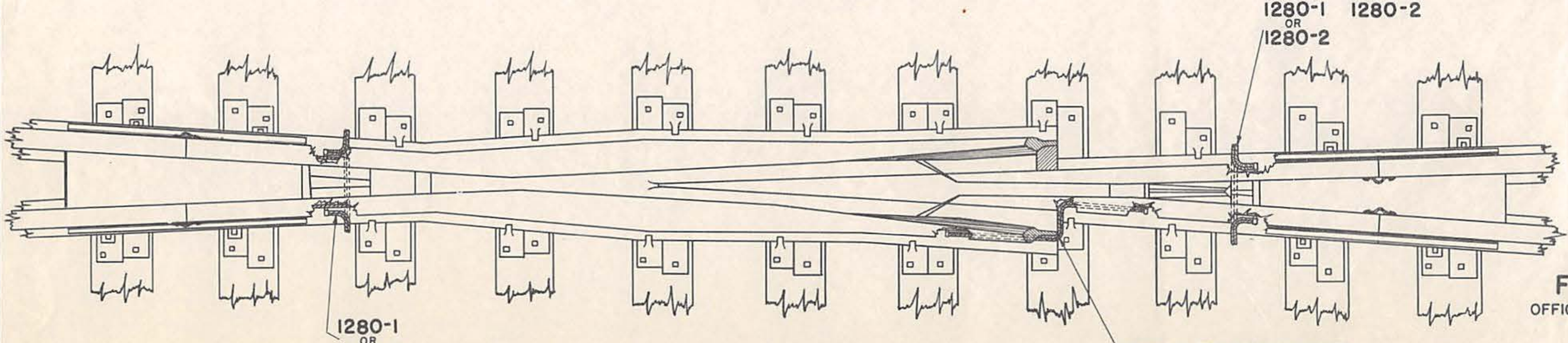

1285-1
1285-1

SELF GUARDED SOLID MANGANESE FROG


1280-3 TO 1280-16 INCL.
"B"
"B"
1280-1 OR 1280-2
1280-1 OR 1280-2

ENLARGED SECTION "B-B"

SPRING RAIL FROG


1280-1 OR 1280-2
1280-1 OR 1280-2
1280-3 TO 1280-16 INCL.

RAIL BOUND MANGANESE FROG

APPROVED
CHIEF ENG'R. MAINTENANCE

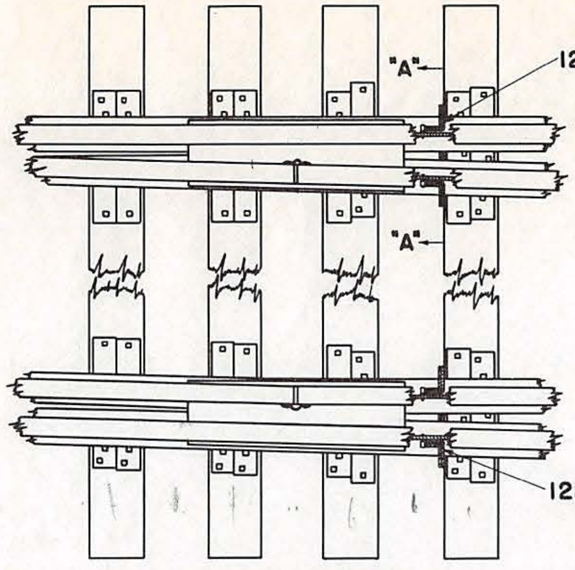
APPROVED
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 11, 1948

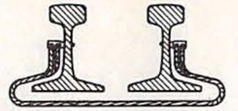
ADOPTED: 3-30-49

SHEET NO. 2

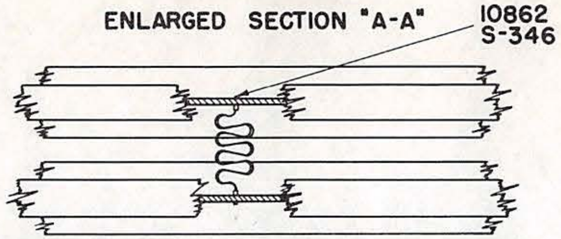
S-128


"A"
1280-1
"A"
1280-1

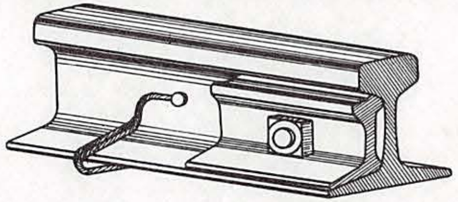
BOND ARRANGEMENT AT HEEL OF SWITCH



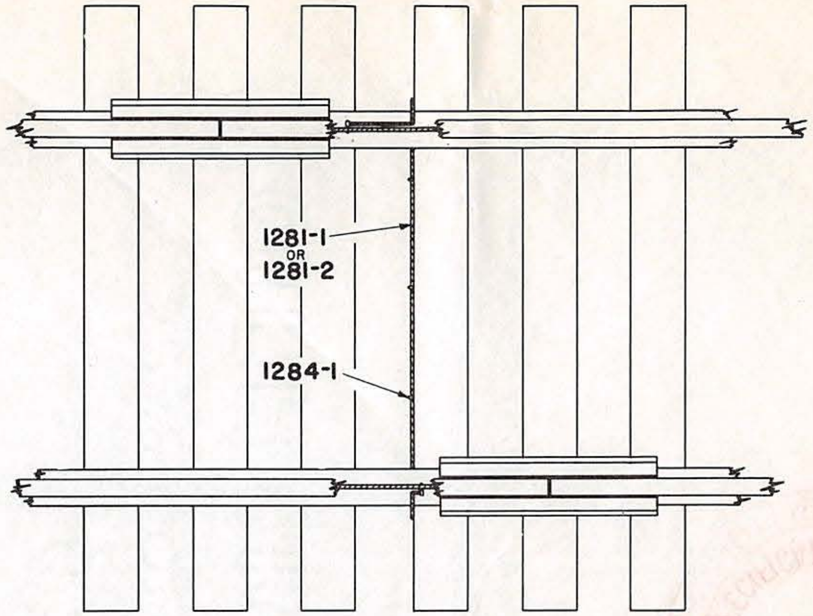
ENLARGED SECTION "A-A"



ALTERNATE ARRANGEMENT FOR 1280-1 BOND USING 2 NO. 6 AWG. COPPERWELD BOND WIRES

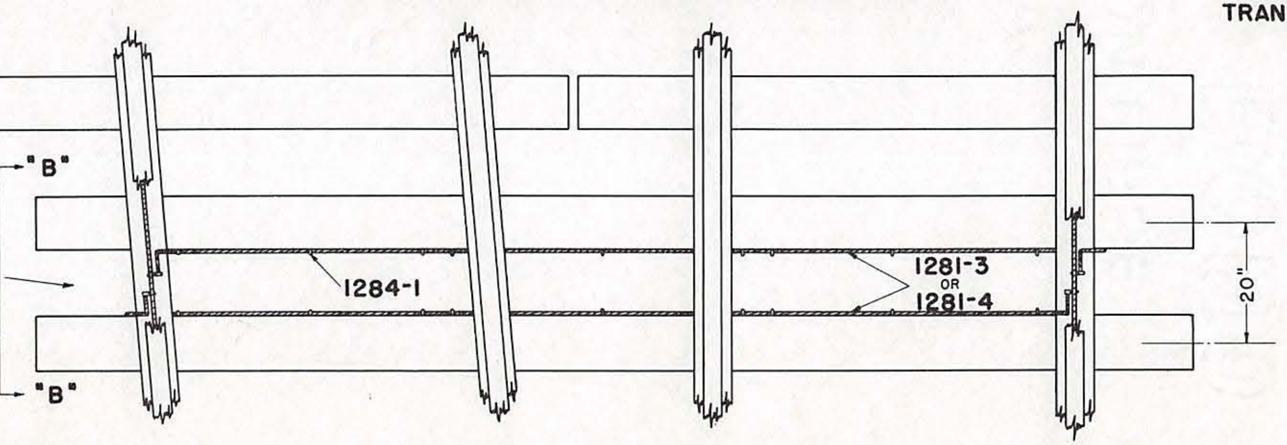


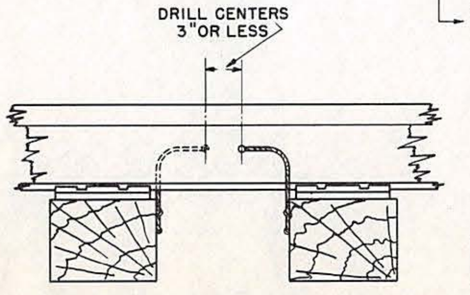
ENLARGED VIEW SHOWING FORMING OF DUPLEX BONDS


1281-1
OR
1281-2
1284-1

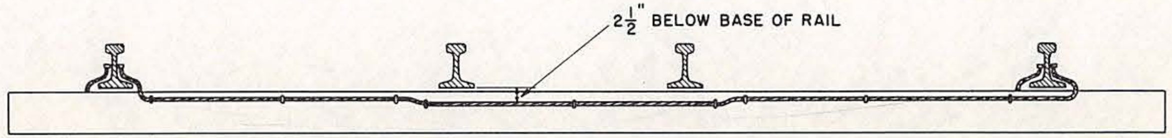
ARRANGEMENT OF TRANSPOSITION BOND

NOTE:
STAPLES SHALL NOT BE DRIVEN NEAR TIE PLATES OR SPIKES.


"B"
ANTI-CREEPERS NOT TO BE USED IN THIS SPACE
1284-1
1281-3
OR
1281-4
20"
"B"


DRILL CENTERS
3" OR LESS

ENLARGED SECTION "B-B"


$2\frac{1}{2}$" BELOW BASE OF RAIL

FOULING BOND ARRANGEMENT FOR SWITCHES & TURNOUTS

APPROVED ______ CHIEF ENG'R. MAINTENANCE

APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

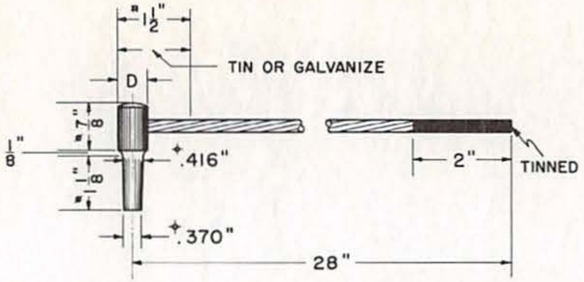
BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 12, 1948

ADOPTED 3-30-49

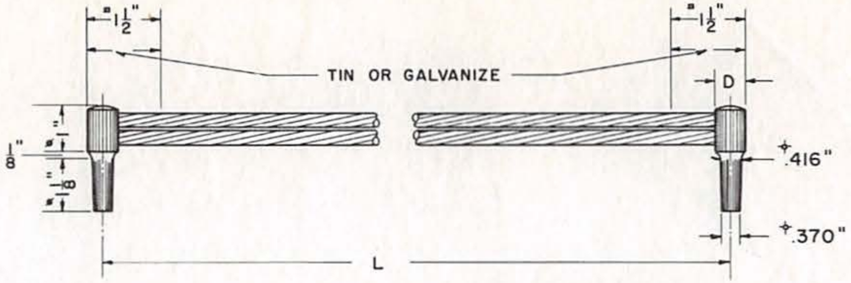
SHEET NO. 3

S-128

RECEIVED
JUN 21 1949
SPECIFICATION DEPT.



	STRAND CONSTRUCTION	
	6 STEEL 1 COPPER	7 COPPER COVERED STEEL
TRACK CIRCUIT CONNECTOR	1289-1	1289-2



	L	STRAND CONSTRUCTION	
		6 STEEL 1 COPPER	7 COPPER COVERED STEEL
DUPLEX CONDUCTOR BOND	28"	1280-1	1280-2
" " "	36"	1280-3	1280-4
" " "	42"	1280-5	1280-6
" " "	48"	1280-7	1280-8
" " "	54"	1280-9	1280-10
" " "	60"	1280-11	1280-12
" " "	72"	1280-13	1280-14
" " "	94"	1280-15	1280-16

NOTES:

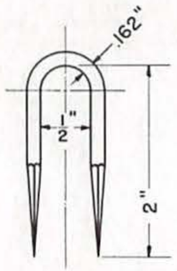
1. PLUG TYPE RAIL BONDS AND TRACK CIRCUIT CONNECTORS SHALL CONFORM TO AAR SPECIFICATION 151.
2. EACH STRAND OF DUPLEX CONDUCTOR BONDS SHALL CONSIST OF 1 ANNEALED COPPER AND 6 GALVANIZED STEEL WIRES IN ACCORDANCE WITH AAR DWG. 16321.
3. SINGLE CONDUCTOR BOND STRAND SHALL CONSIST OF 1 ANNEALED COPPER AND 6 GALVANIZED STEEL WIRES IN ACCORDANCE WITH AAR. DWG. 16311.
4. TRACK CIRCUIT CONNECTOR STRAND SHALL CONSIST OF 1 ANNEALED COPPER AND 6 GALVANIZED STEEL WIRES IN ACCORDANCE WITH AAR. DWG. 16312.
5. WHERE THE USE OF NO-OX-ID GREASE IS INSUFFICIENT TO PREVENT CORROSION EACH BOND STRAND SHALL CONSIST OF 7-40 % COPPER COVERED STEEL WIRES.

TYPICAL ORDERING REFERENCE

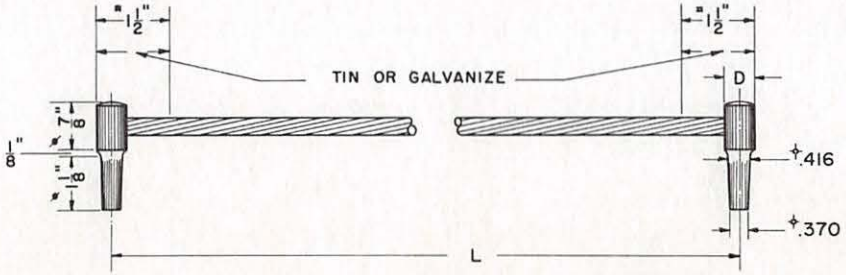
___ SINGLE CONDUCTOR PLUG TYPE RAIL BONDS, LENGTH 108", NO. 1281-1, PLAN S-128, SH. 4.

___ DUPLEX CONDUCTOR PLUG TYPE RAIL BONDS, LENGTH 28" NO. 1280-1, PLAN S-128, SH. 4.

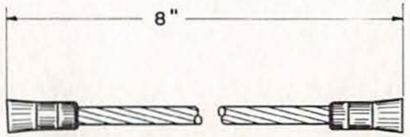
___ SINGLE CONDUCTOR PLUG TYPE TRACK CIRCUIT CONNECTORS, LENGTH 28" NO. 1289-1, PLAN S-128, SH. 4.



COPPERWELD ROLLED POINT
STAPLE-RP96 - **1284-1**



	L	STRAND CONSTRUCTION	
		6 STEEL 1 COPPER	7 COPPER COVERED STEEL
SINGLE CONDUCTOR BOND	108"	1281-1	1281-2
" " "	180"	1281-3	1281-4



FROG BOND **1285-1**
TYPE T CADWELD NO. 21200

TOLERANCES

✦ = .004" UNDER .001" OVER
↘ = .006" UNDER OR OVER
▪ .250" UNDER

L = TO BE SPECIFIED ON ORDER
D = 1/2" DIAMETER FOR DUPLEX
9/16" DIAMETER FOR SINGLE

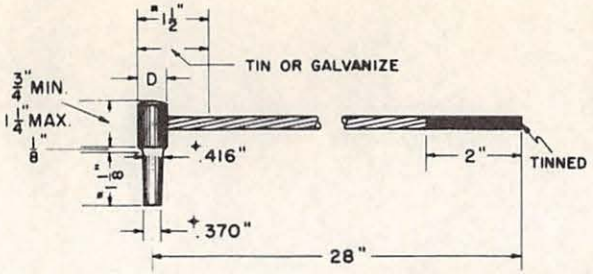
APPROVED: O.G. Harmon
CHIEF ENG'R. MAINTENANCE

APPROVED: A.J. Auer
CHIEF ENG'R. COMM. & SIGS.

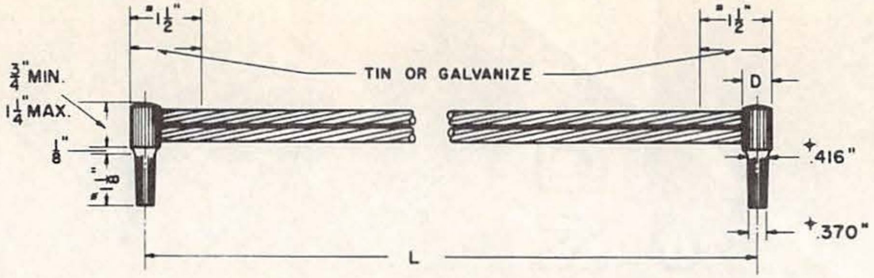
BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 15, 1948

ADOPTED: 3-30-49

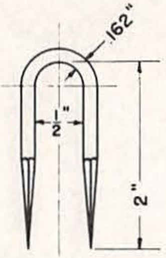
SHEET NO. 4 S-128



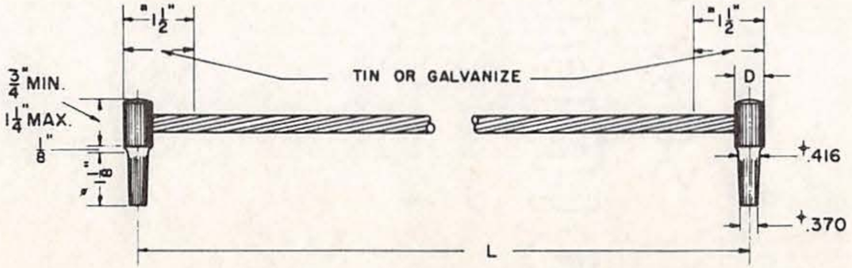
	STRAND CONSTRUCTION	
	6 STEEL 1 COPPER	7 COPPER COVERED STEEL
TRACK CIRCUIT CONNECTOR	1289-1	1289-2



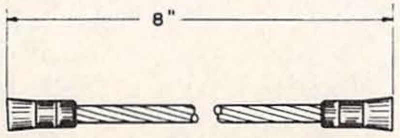
	L	STRAND CONSTRUCTION	
		6 STEEL 1 COPPER	7 COPPER COVERED STEEL
DUPLEX CONDUCTOR BOND	28"	1280-1	1280-2
" " "	36"	1280-3	1280-4
" " "	42"	1280-5	1280-6
" " "	48"	1280-7	1280-8
" " "	54"	1280-9	1280-10
" " "	60"	1280-11	1280-12
" " "	72"	1280-13	1280-14
" " "	94"	1280-15	1280-16



COPPERWELD ROLLED POINT
STAPLE-RP96- **1284-1**



	L	STRAND CONSTRUCTION	
		6 STEEL 1 COPPER	7 COPPER COVERED STEEL
SINGLE CONDUCTOR BOND	108"	1281-1	1281-2
" " "	180"	1281-3	1281-4



FROG BOND **1285-1**

TYPE T CADWELD NO. 21200

NOTES:

1. PLUG TYPE RAIL BONDS AND TRACK CIRCUIT CONNECTORS SHALL CONFORM TO AAR SPECIFICATION 151.
2. WHERE THE USE OF NO-OX-ID GREASE IS INSUFFICIENT TO PREVENT CORROSION EACH BOND STRAND SHALL CONSIST OF 7-40% COPPER COVERED STEEL WIRES.
3. UNLESS OTHERWISE SPECIFIED WIRES IN STRAND SHALL BE ANNEALED.
4. UNLESS OTHERWISE SPECIFIED STRAND SHALL BE BUTTWELDED TO PLUG.

TOLERANCES

◇ = .004" UNDER .001" OVER
⌑ = .006" UNDER OR OVER
□ = .250" UNDER
D = 1/2" MIN. 3/4" MAX.
L = TO BE SPECIFIED ON ORDER.

TYPICAL ORDERING REFERENCE

___ SINGLE CONDUCTOR PLUG TYPE RAIL BONDS, LENGTH 108", NO. 1281-1, PLAN S-128

___ DUPLEX CONDUCTOR PLUG TYPE RAIL BONDS, LENGTH 28" NO. 1280-1, PLAN S-128.

___ SINGLE CONDUCTOR PLUG TYPE TRACK CIRCUIT CONNECTORS, LENGTH 28" NO. 1289-1, PLAN S-128.

STRAND FOR DUPLEX CONDUCTOR BONDS

Wires in each Strand	Diameter		Length of Strand Lay
	Each Wire	Each Strand	
1 Copper, 6 Galvanized steel	.077"	.231"	2.54"
7-40% Copper covered steel	.081"	.243"	2.75"

STRAND FOR SINGLE CONDUCTOR BONDS AND TRACK CIRCUIT CONNECTORS

Wires in each Strand	Diameter		Length of Strand Lay
	Each Wire	Each Strand	
1 Copper, 6 Galvanized steel	.109"	.327"	3.75"
7-40% Copper covered steel	.102"	.306"	3.00"

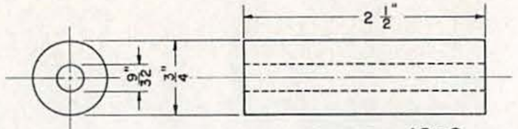
APPROVED: ____________
CHIEF ENG'R. MAINTENANCE

APPROVED: ____________
CHIEF ENG'R. COMM. & SIGS.

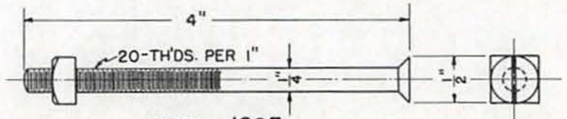
BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 15, 1948

ADOPTED: 3-30-49
Revised 10-16-50 account chang
in A.A.R. Spec. 151-49.

S-128-A

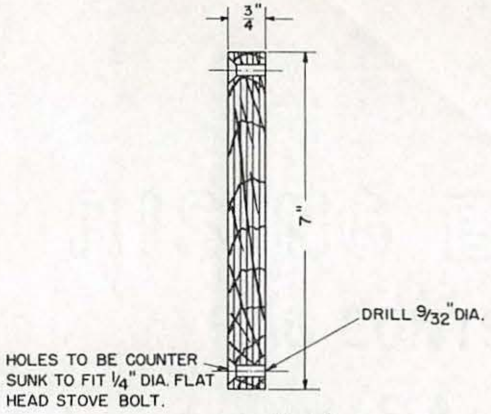


SPACER - 1292



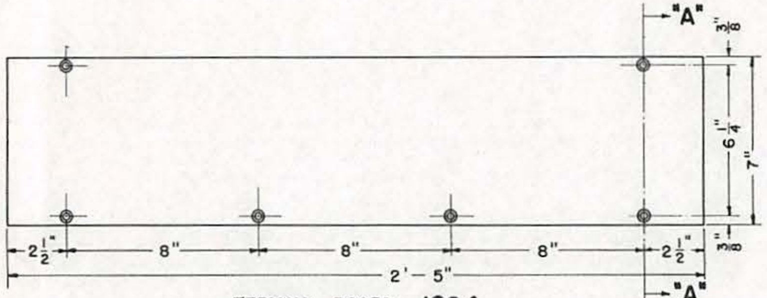
4"
20-TH'DS. PER 1"
1/4"
1/2"

BOLT - 1293



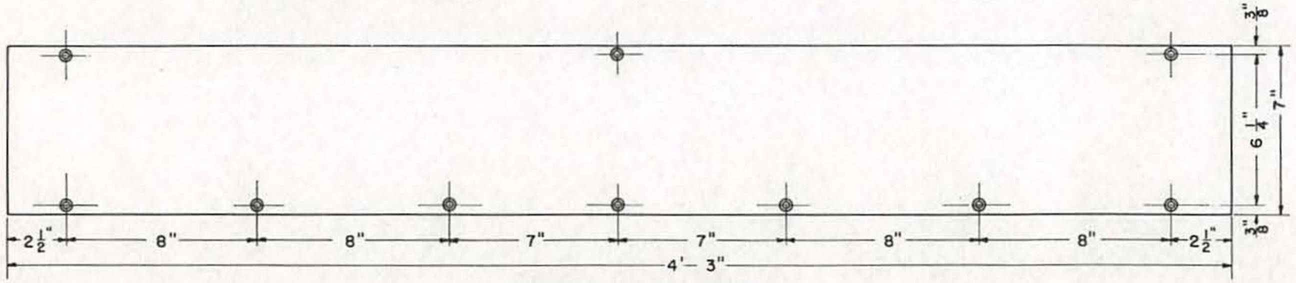
3/4"
7"
DRILL 9/32" DIA.
HOLES TO BE COUNTER SUNK TO FIT 1/4" DIA. FLAT HEAD STOVE BOLT.

SECTION "A-A"



"A"
3/8"
6 1/4"
7"
3/8"
2 1/2"
8"
8"
8"
2 1/2"
2'-5"
"A"

TERMINAL BOARD - 1294



3/8"
6 1/4"
7"
3/8"
2 1/2"
8"
8"
7"
7"
8"
8"
2 1/2"
4'-3"

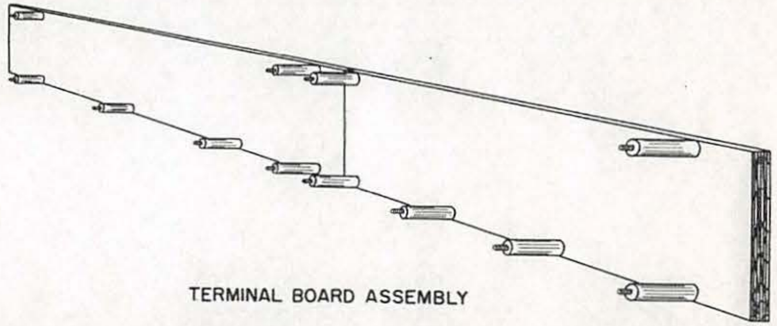
TERMINAL BOARD - 1295

MATERIAL REQUIRED FOR ONE TERMINAL BOARD COMPLETE				
ITEM NO.	For 1203 Assembly No. 12910	For 1204 Assembly No. 12911	For 1205 Assembly No. 12912	For 1206 Assembly No. 12913
1292	6	12	12	16
1293	6	12	12	16
1294	1	2	2	1
1295				1

NOTE:

Terminal board shall be constructed of plywood or well seasoned lumber, and finished with one coat of grey cab enamel No. 83-503, stock L-89.

Spacers may be constructed from wood dowels, or other non-conductive material.



TERMINAL BOARD ASSEMBLY

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

ADOPTED:-2-5-47
Revised 12-12-51: Assembly Nos. added and plywood added to materials.

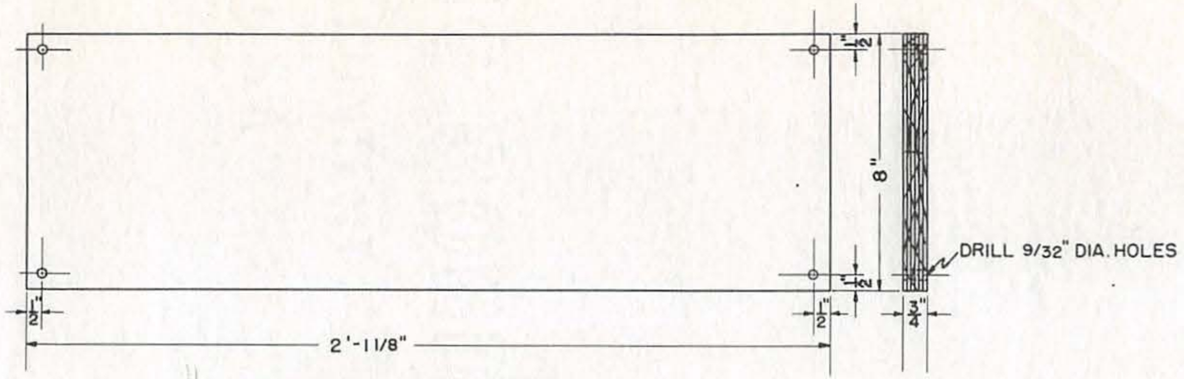
BALTIMORE & OHIO RAILROAD

TERMINAL BOARD & FITTINGS FOR STEEL RELAY CASES

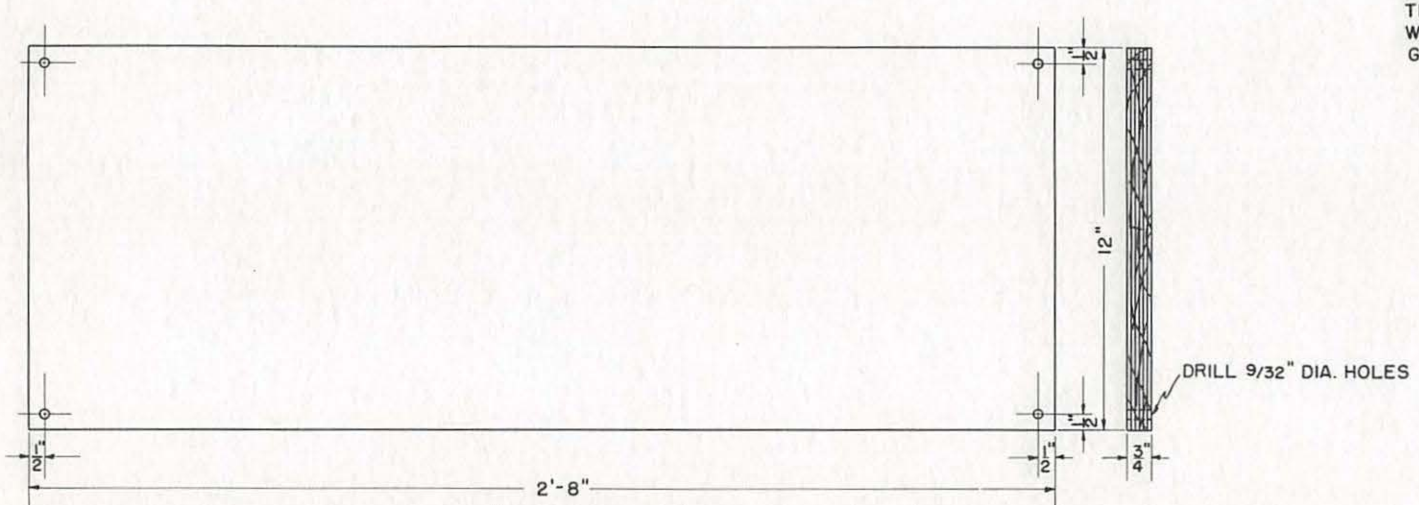
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 4, 1946

SHEET NO. 1

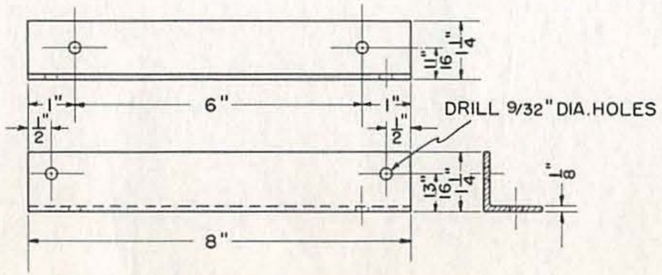
S-129-A


1/2"
8"
1/2"
1/2"
1/2"
3/4"
DRILL 9/32" DIA. HOLES
2'-1 1/8"

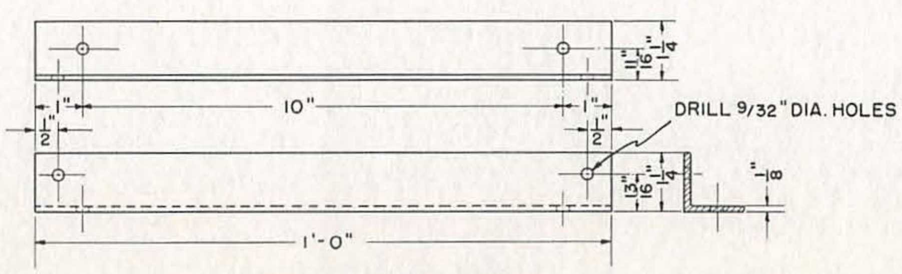
TERMINAL BOARD - **1297**


1/2"
12"
1/2"
1/2"
1/2"
3/4"
DRILL 9/32" DIA. HOLES
2'-8"

TERMINAL BOARD - **1298**


11/16"
1/4"
1"
6"
1"
1/2"
1/2"
DRILL 9/32" DIA. HOLES
13/16"
1/4"
1/8"
8"

MOUNTING ANGLE - **1297-1**


11/16"
1/4"
1"
10"
1"
1/2"
1/2"
DRILL 9/32" DIA. HOLES
13/16"
1/4"
1/8"
1'-0"

MOUNTING ANGLE -**1298-1**

MATERIAL REQUIRED FOR ONE TERMINAL BOARD COMPLETE

ITEM NO.	For 1201 Assembly No. 12914	For 1202 Assembly No. 12915		
1297	1			
1297-1	2			
1298		1		
1298-1		2		
1/4" DIA. X 1 1/4" LG. (R.H.) GALV. STOVE BOLTS	8	8		

NOTE:

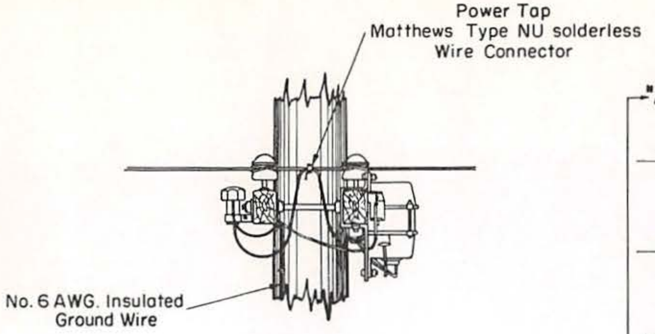
TERMINAL BOARDS SHALL BE CONSTRUCTED OF PLYWOOD OR WELL SEASONED LUMBER AND FINISHED WITH ONE COAT OF GREY CAB ENAMEL NO. 83-503, STOCK L-89.

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

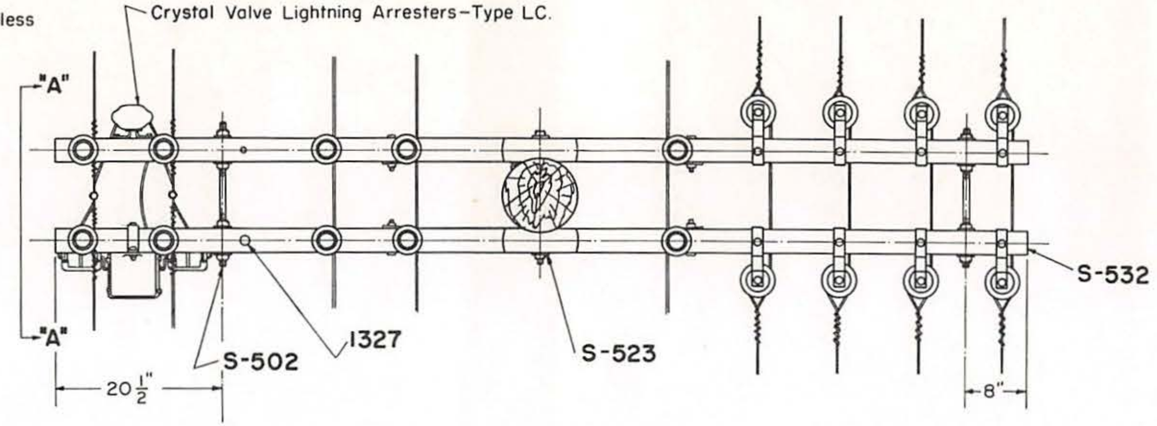
BALTIMORE & OHIO RAILROAD
TERMINAL BOARD & FITTINGS FOR STEEL RELAY CASES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
SEPT. 9, 1948

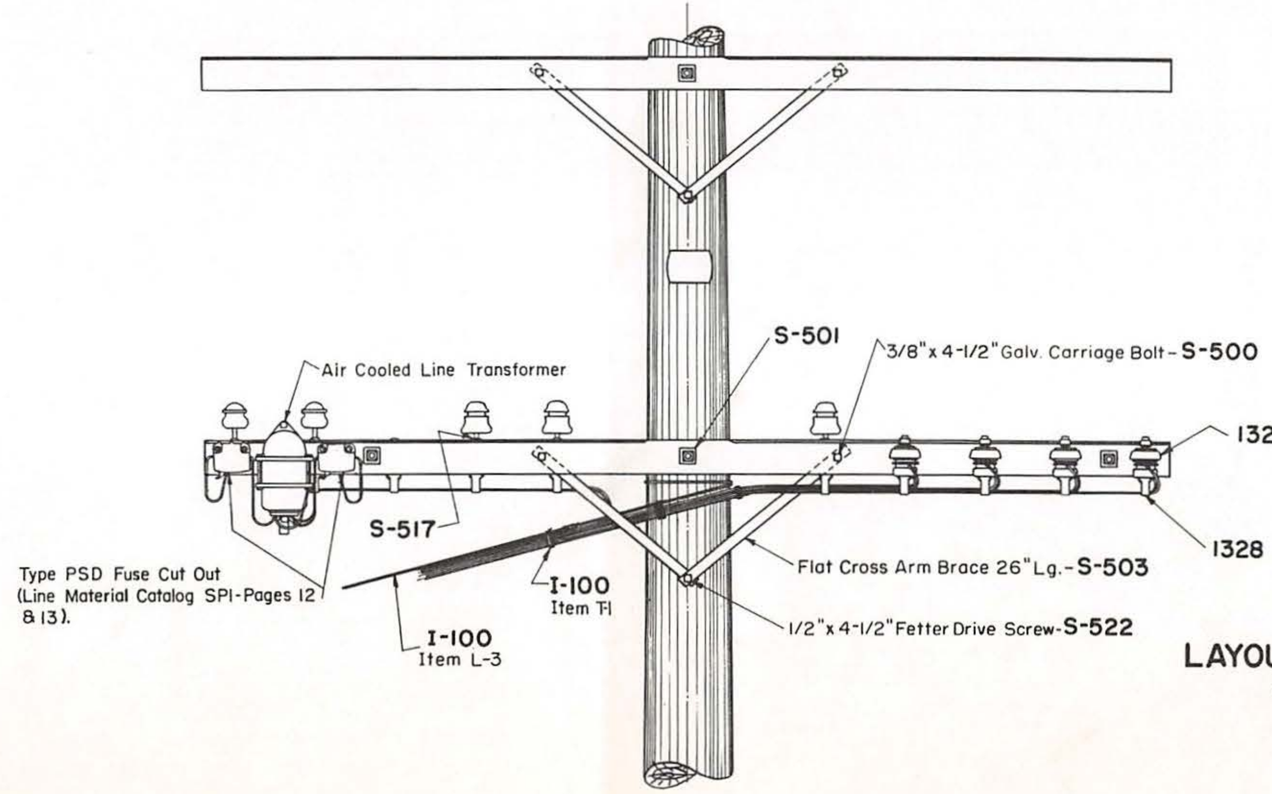
SHEET NO. 2 S-129-A

Revised 12-12-51: Assembly Nos. added


Power Tap
Matthews Type NU solderless
Wire Connector
No. 6 AWG. Insulated
Ground Wire

VIEW "A-A"


Crystal Valve Lightning Arresters-Type LC.
"A"
"A"
S-502
1327
S-523
S-532
20 1/2"
8"


Air Cooled Line Transformer
S-501
3/8"x 4-1/2" Galv. Carriage Bolt - S-500
1321
1328
S-517
Type PSD Fuse Cut Out
(Line Material Catalog SPI-Pages 12
& 13).
I-100
Item T-1
I-100
Item L-3
Flat Cross Arm Brace 26" Lg. - S-503
1/2"x 4-1/2" Fetter Drive Screw - S-522

NOTES:

See Dwg. S-533 for further details of Crossarm assembly.
Messenger may be attached to ground wire.
For method of terminating line wires see Dwg. S-131-A.

Approved: A L Jordan
Signal Engineer

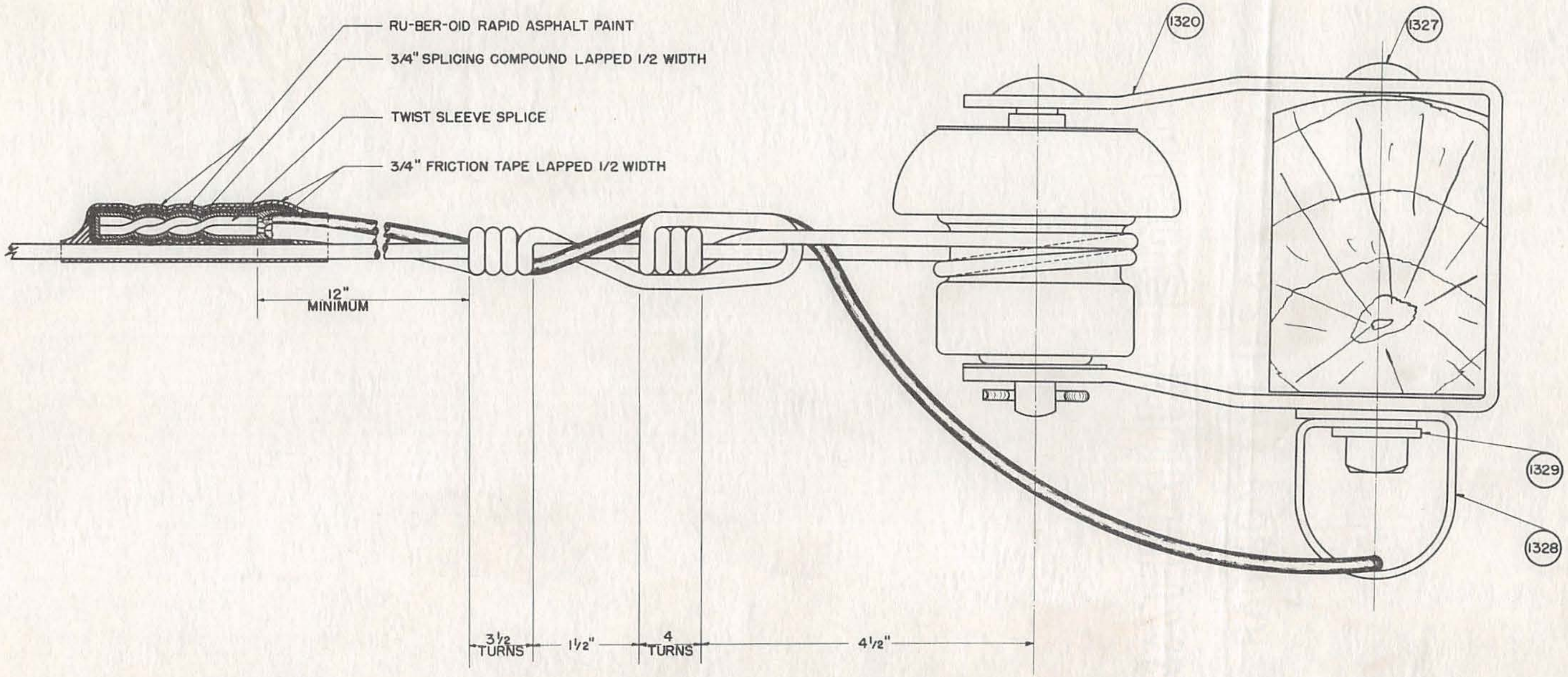
BALTIMORE & OHIO RAILROAD

LAYOUT FOR TRANSFORMER CONNECTIONS
440 VOLT SIGNAL POWER LINE

Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

Made & Corrected 9-6-49
Adopted 5-16-51
12-4-58: Type of Fuse Cut Out changed.

S-130-A


RU-BER-OID RAPID ASPHALT PAINT
3/4" SPLICING COMPOUND LAPPED 1/2 WIDTH
TWIST SLEEVE SPLICE
3/4" FRICTION TAPE LAPPED 1/2 WIDTH
12" MINIMUM
1320
1327
1329
1328
3½ TURNS
1½"
4 TURNS
4½"

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

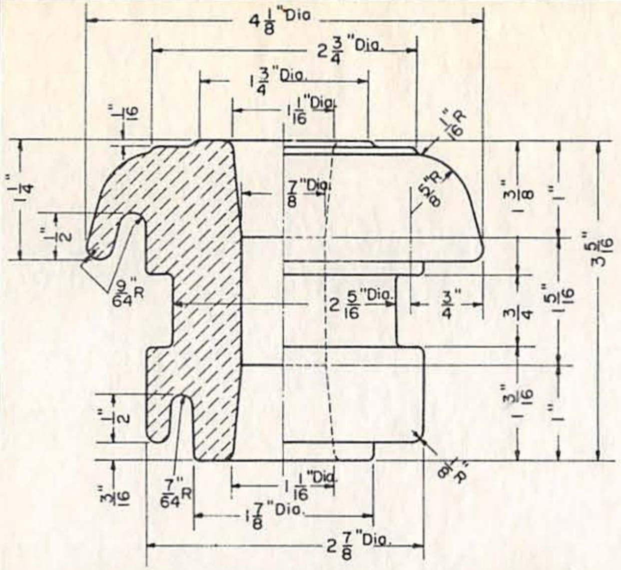
BALTIMORE & OHIO RAILROAD

METHOD OF TERMINATING LINE WIRE

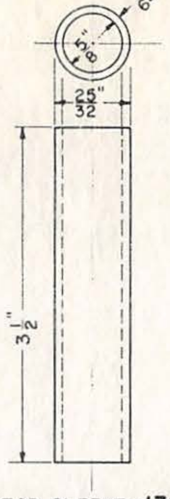
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 16, 1947

S-131

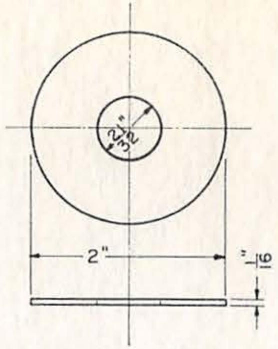
ADOPTED: 5-27-47


4 1/8" Dia
2 3/4" Dia
1 3/4" Dia
1 1/16" Dia
1/16
1/16" R
1 1/4"
1/2"
7/8" Dia
5/8" R
3/8
1 3/8
1"
3 5/16"
9/64" R
2 5/16" Dia
3/4"
3/4
1 5/16
1/2"
1 3/16
1"
1/16" R
7/64" R
3/16"
1 1/16" Dia
1 7/8" Dia
2 7/8" Dia

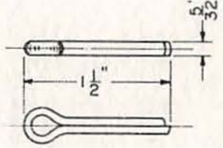
WHITE PORCELAIN INSULATOR (Wet Process) - 1320
BROWN PORCELAIN INSULATOR (Wet Process) - 1321
Porcelain Products, Inc. No. A-495


5/64"
5/8"
25/32"
3 1/2"

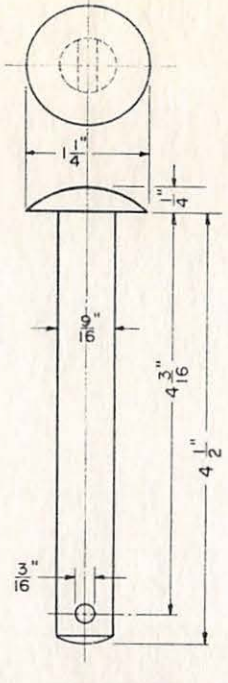
LEAD SLEEVE - 1323



LEAD WASHER - 1324



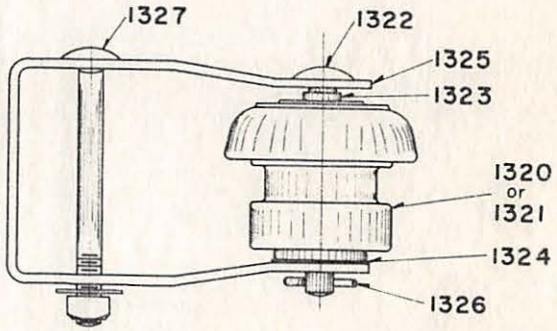
BRASS SPRING COTTER - 1326


1 1/4"
1/4"
15/16"
4 3/16"
4 1/2"
3/16"

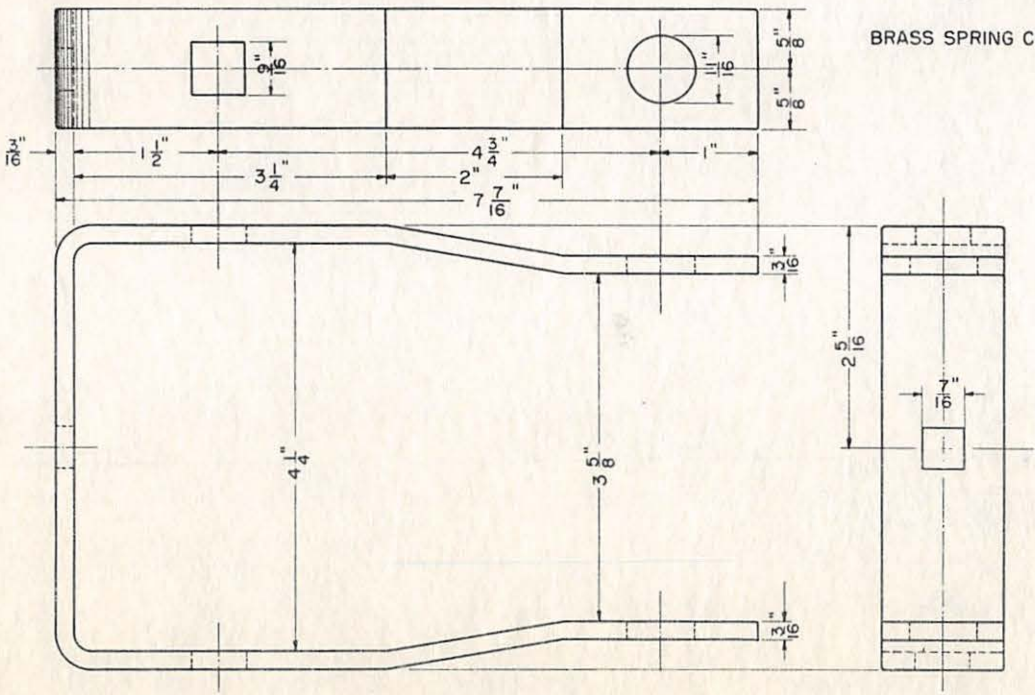
PIN - 1322
Cold Rolled Steel (Galvanized).

MATERIAL REQUIRED FOR DEAD ENDING SHACKLE

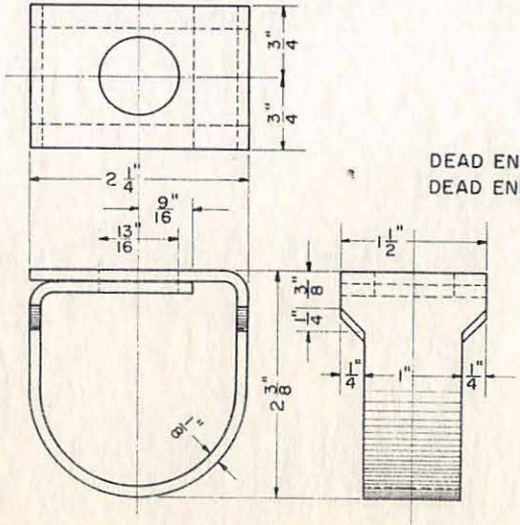
ITEM	REQD	NAME	MF'G.	REF.	PLAN NO.
1321	1	Porcelain Insulator Wet Process (Brown).	P.P.Co	A-495	S-132-A
1322	1	Pin (Cold Rolled Steel) Galv.			S-132-A
1323	1	Lead Sleeve.			S-132-A
1324	1	Lead Washer.			S-132-A
1325	1	Shackle.			S-132-A
1326	1	5/32" x 1-1/2" Brass Spring Cotter.			S-132-A
1327	1	1/2" ϕ x 5-1/2" lg. Std. Carriage Bolt with flat washer and Sq. nut. (Galv.)			
1328	1	Fibre Bridle Ring			S-132-A
1320	1	Porcelain Insulator Wet Process (White).			


1327
1322
1325
1323
1320
or
1321
1324
1326

DEAD ENDING SHACKLE ASSEMBLY WITH NO. 1320 INSULATOR - 13210
DEAD ENDING SHACKLE ASSEMBLY WITH NO. 1321 INSULATOR - 13211


9/16"
11/16"
5/8"
5/8"
3/16"
1 1/2"
4 3/4"
1"
3 1/4"
2"
7 7/16"
3/16"
4 1/4"
3 5/8"
3/16"
2 5/16"
7/16"

SHACKLE - 1325
Galvanized Steel

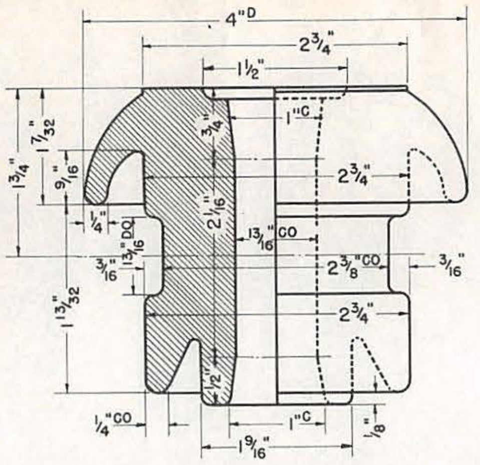

3/4"
3/4"
2 1/4"
9/16"
13/16"
1 1/2"
3/8
1/4"
1/4"
1"
1/4"
2 3/8"
1/16"

FIBRE BRIDLE RING - 1328

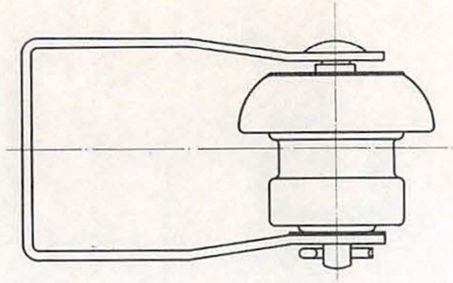
Approved: Asthur
Chief Eng'r. Comm. & Sigs

BALTIMORE & OHIO RAILROAD
POLE LINE FITTINGS
Office of Chief Engineer Comm.
Baltimore, Md.
July 9, 1951

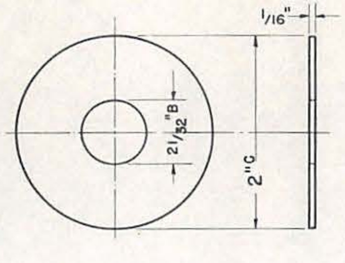
New Plan made 7-9-51.


4"D
2 3/4"
1 1/2"
1"C
3/4"
2 3/4"
2 1/16"
1 3/4"
1 7/32"
9/16"
1/4"
13/16" DO
3/16"
13/16" CO
2 3/8" CO
3/16"
2 3/4"
1 13/32"
1/2"
1/4" CO
1"C
1/8"
1 9/16"

PORCELAIN INSULATOR (WET PROCESS) - 1321
COLOR = BROWN OR WHITE AS SPECIFIED



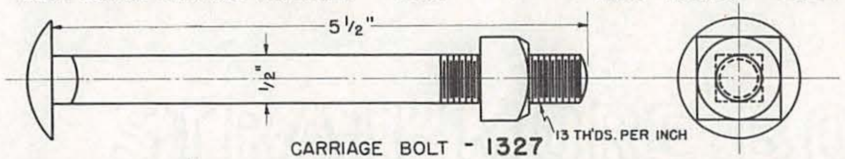
DEAD ENDING SHACKLE ASSEMBLY - 1320


1/16"
2 1/32" B
2" C

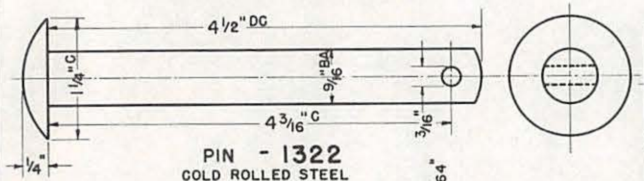
LEAD WASHER - 1324

ITEM	REQ'D	NAME	MF'G.	REF.	PLAN NO
		MATERIAL REQUIRED FOR DEAD ENDING SHACKLE			
1321	1	PORCELAIN INSULATOR WET PROCESS			S-132
1322	1	PIN (COLD ROLLED STEEL)			S-132
1323	1	LEAD SLEEVE			S-132
1324	1	LEAD WASHER			S-132
1325	1	SHACKLE			S-132
1326	1	5/32" X 1-1/2" LG. BRASS SPRING COTTER			S-132

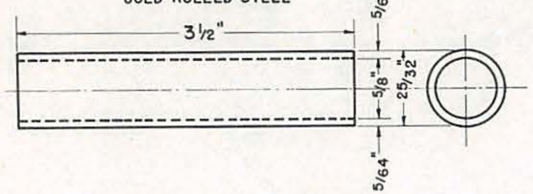
		DEAD END ACCESSORIES			
1327	1	1/2"ϕ X 5-1/2" LG. STD. CARRIAGE BOLT			S-132
1328	1	FIBRE BRIDLE RING			S-132
1329	1	1/2" STEEL WASHER		AAR	T&T1759-2


5 1/2"
1/2"
13 TH'DS. PER INCH

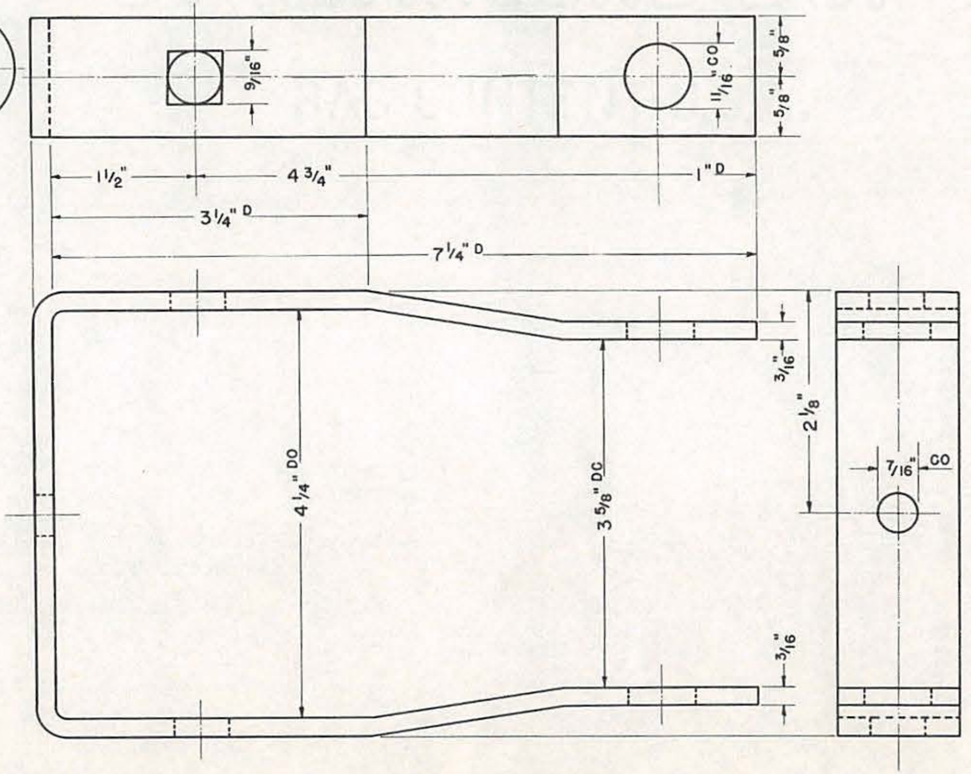
CARRIAGE BOLT - 1327


4 1/2" DC
1 1/4" C
9/16" BA
4 3/16" C
3/16"
1/4"

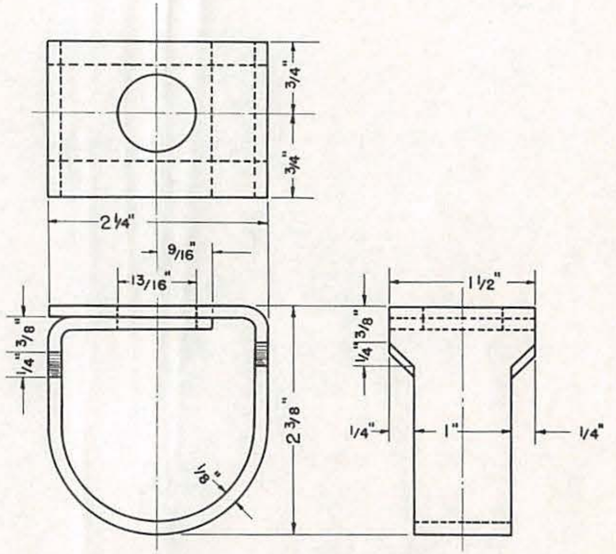
PIN - 1322
COLD ROLLED STEEL


3 1/2"
5/64"
5/8"
25/32"
5/64"

LEAD SLEEVE - 1323

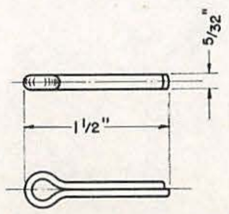

9/16"
11/16" CO
5/8"
5/8"
1 1/2"
4 3/4"
1" D
3 1/4" D
7 1/4" D
3/16"
2 1/8"
4 1/4" DO
3 5/8" DC
7/16" CO
3/16"

SHACKLE - 1325
GALVANIZED STEEL


3/4"
3/4"
2 1/4"
9/16"
13/16"
1 1/2"
3/8"
1/4"
2 3/8"
3/8"
1/4"
1/4"
1"
1/4"
1/8"

FIBRE BRIDLE RING - 1328

M'F'G. TOLERANCES	OVER	UNDER
BA	1/32"	1/64"
B	1/32"	1/32"
C	1/16"	1/16"
D	1/8"	1/8"
E	1/4"	1/4"
CO	1/16"	0
DO	1/8"	0
DC	1/8"	1/16"

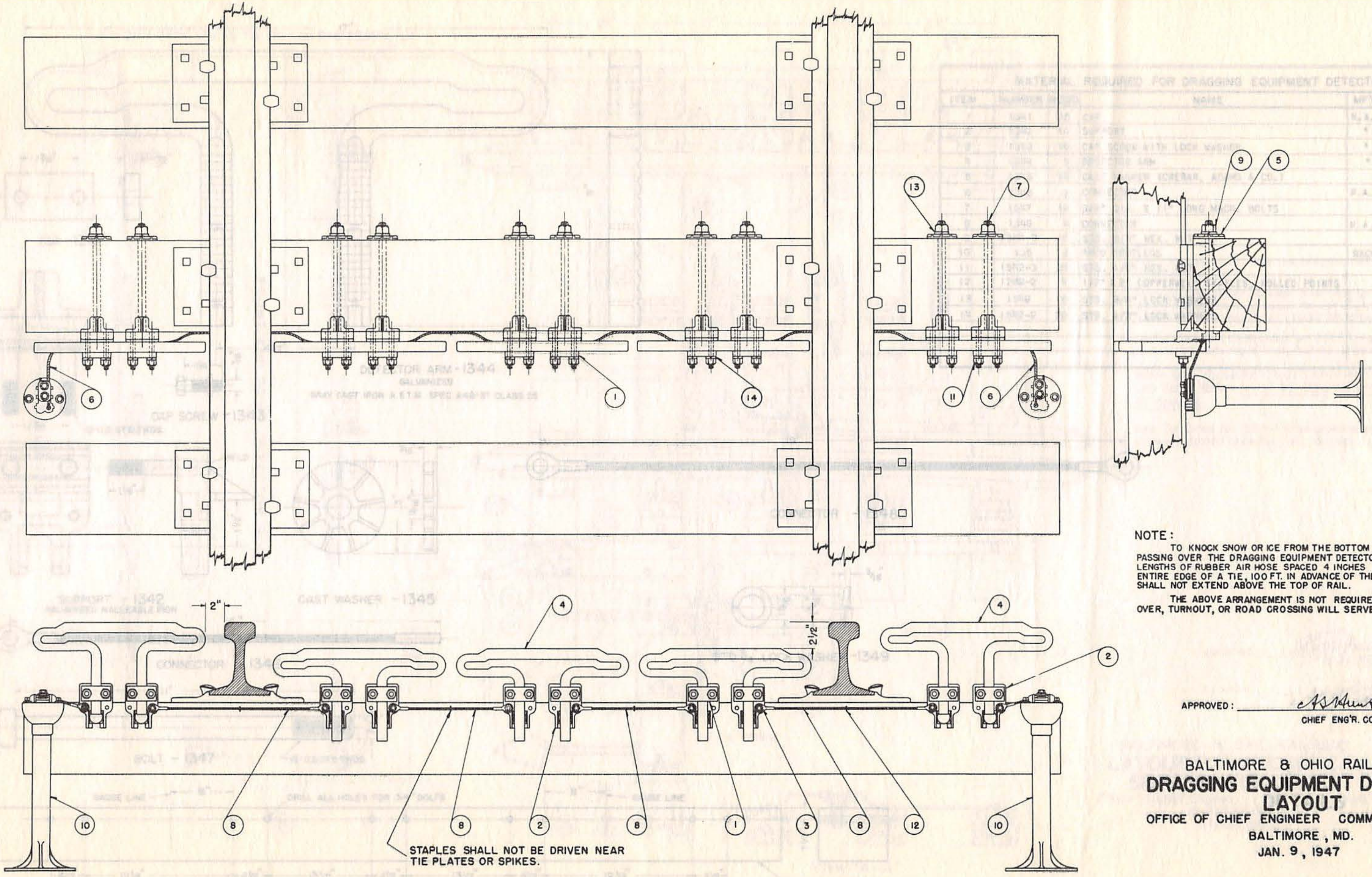


BRASS SPRING COTTER - 1326

APPROVED: AHHunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
POLE LINE FITTINGS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV 23, 1946

S-132



STAPLES SHALL NOT BE DRIVEN NEAR TIE PLATES OR SPIKES.

NOTE:

TO KNOCK SNOW OR ICE FROM THE BOTTOM OF CARS BEFORE PASSING OVER THE DRAGGING EQUIPMENT DETECTOR, NAIL SHORT LENGTHS OF RUBBER AIR HOSE SPACED 4 INCHES APART ALONG THE ENTIRE EDGE OF A TIE, 100 FT. IN ADVANCE OF THE DETECTOR. HOSES SHALL NOT EXTEND ABOVE THE TOP OF RAIL.

THE ABOVE ARRANGEMENT IS NOT REQUIRED WHERE A CROSS-OVER, TURNOUT, OR ROAD CROSSING WILL SERVE THE SAME PURPOSE.

APPROVED: ASHunt
CHIEF ENG'R. COMM. & SIGS.

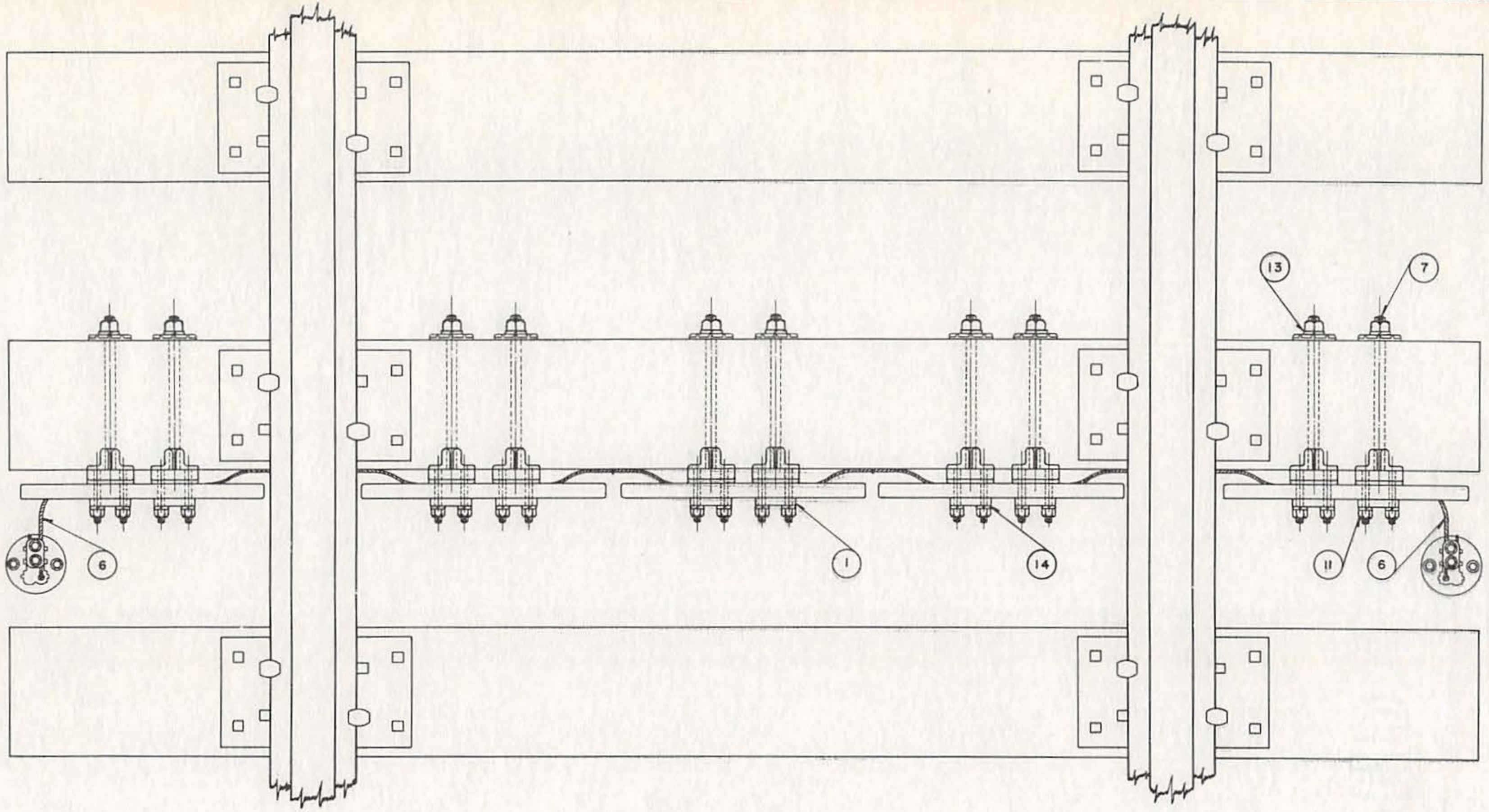
BALTIMORE & OHIO RAILROAD

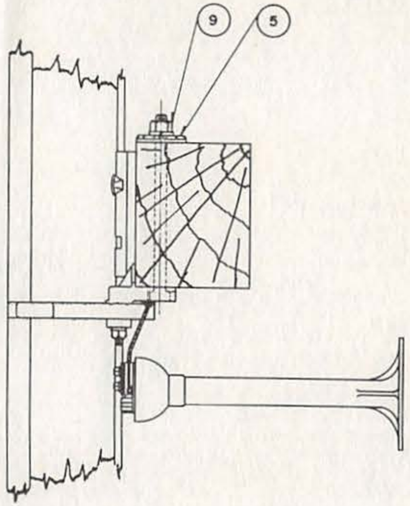
DRAGGING EQUIPMENT DETECTOR LAYOUT

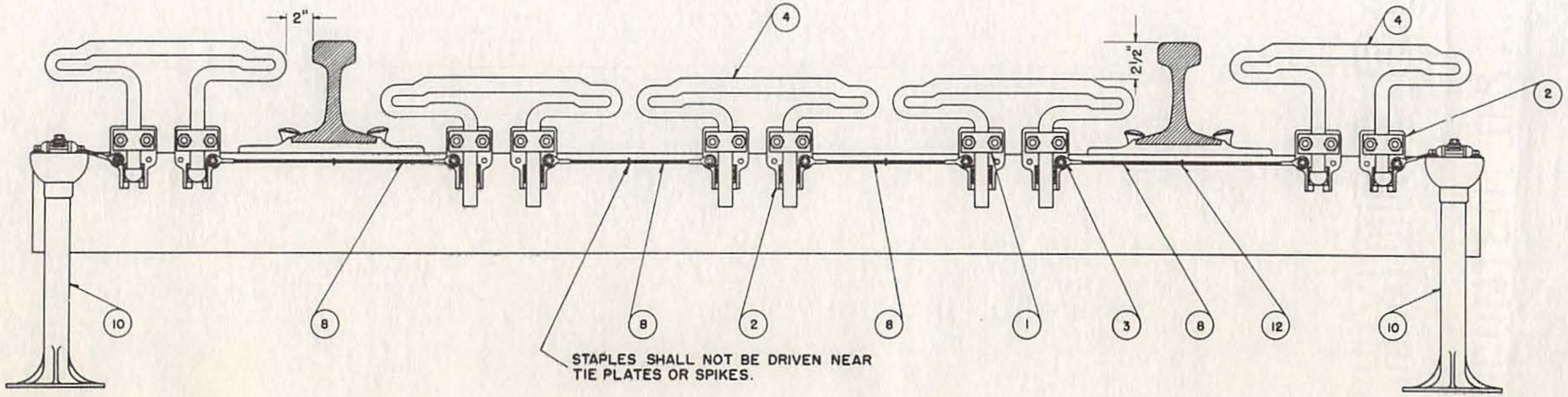
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 9, 1947

SHEET NO. 1

S-134


13
7
6
1
14
11
6




2"
4
2½"
4
2
10
8
8
2
8
1
3
8
12
10
STAPLES SHALL NOT BE DRIVEN NEAR
TIE PLATES OR SPIKES.

NOTE:

TO KNOCK SNOW OR ICE FROM THE BOTTOM OF CARS BEFORE PASSING OVER THE DRAGGING EQUIPMENT DETECTOR, NAIL SHORT LENGTHS OF RUBBER AIR HOSE SPACED 4 INCHES APART ALONG THE ENTIRE EDGE OF A TIE, 100 FT. IN ADVANCE OF THE DETECTOR. HOSES SHALL NOT EXTEND ABOVE THE TOP OF RAIL.

THE ABOVE ARRANGEMENT IS NOT REQUIRED WHERE A CROSS-OVER, TURNOUT, OR ROAD CROSSING WILL SERVE THE SAME PURPOSE.

APPROVED: ASHunt
CHIEF ENG'R. COMM. & SIGS.

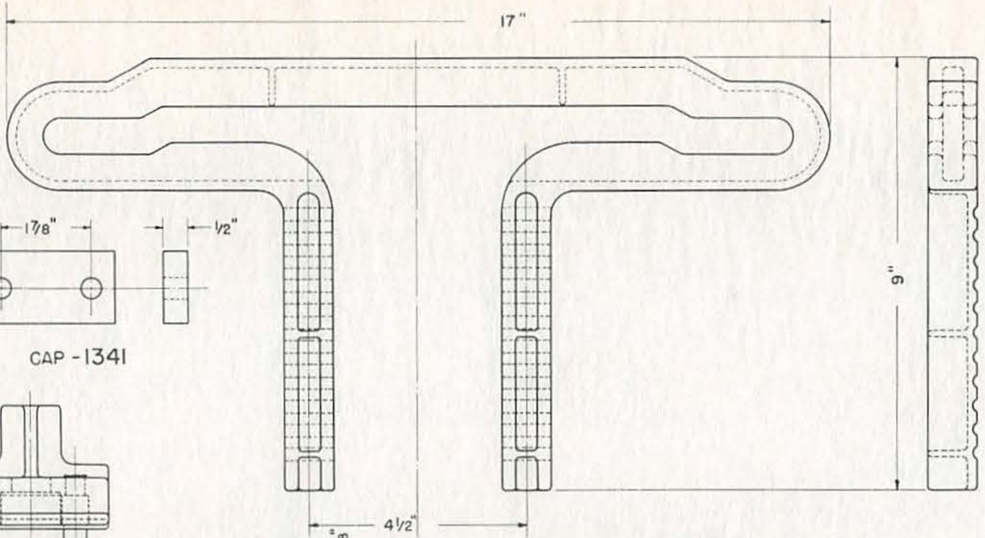
BALTIMORE & OHIO RAILROAD

DRAGGING EQUIPMENT DETECTOR LAYOUT

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 9, 1947

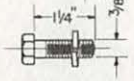
SHEET NO. 1

S-134

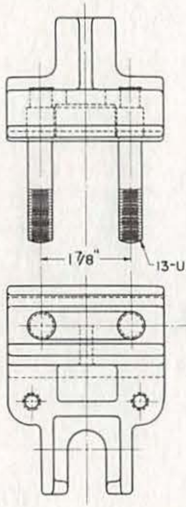


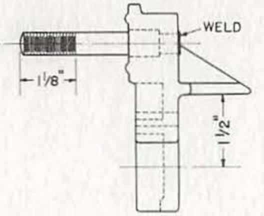
DETECTOR ARM - 1344
GALVANIZED
GRAY CAST IRON A.S.T.M. SPEC. A48-3T CLASS 25

CAP - 1341

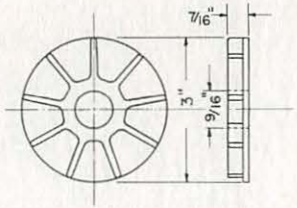


CAP SCREW - 1343

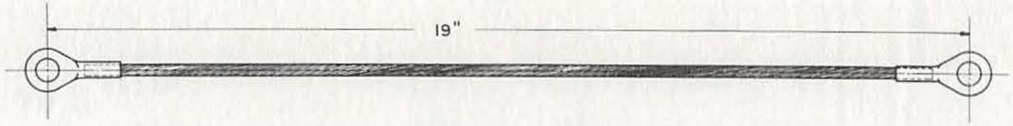

1⅞"
13-U.S. ST'D. TH'DS.



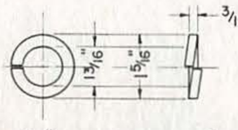
SUPPORT - 1342
GALVANIZED MALLEABLE IRON



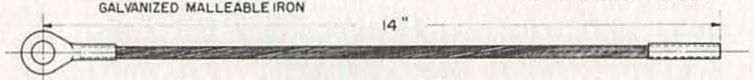
CAST WASHER - 1345



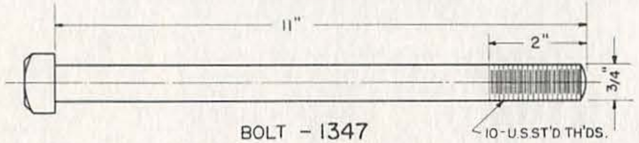
CONNECTOR - 1348


3/16"
13/16"
1 5/16"

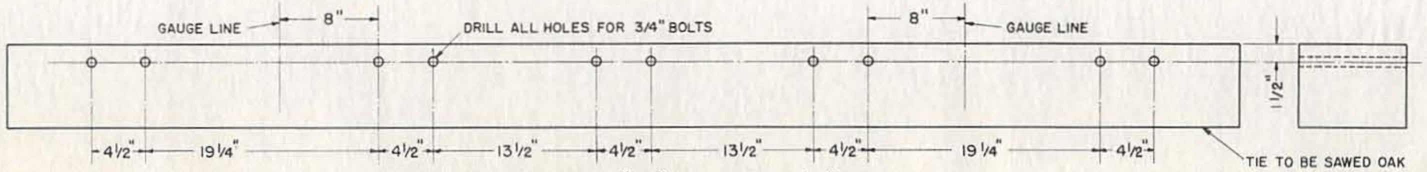
STD. ¾" LOCK WASHER - 1349



CONNECTOR - 1346


11"
2"
¾
10-U.S. ST'D. TH'DS.

BOLT - 1347


GAUGE LINE
8"
DRILL ALL HOLES FOR 3/4" BOLTS
8"
GAUGE LINE
1½"
4½"
19¼"
4½"
13½"
4½"
13½"
4½"
19¼"
4½"
TIE TO BE SAWED OAK

DRILLING FOR STANDARD 7"X9" CROSS TIE 8'-6" LONG

MATERIAL REQUIRED FOR DRAGGING EQUIPMENT DETECTOR

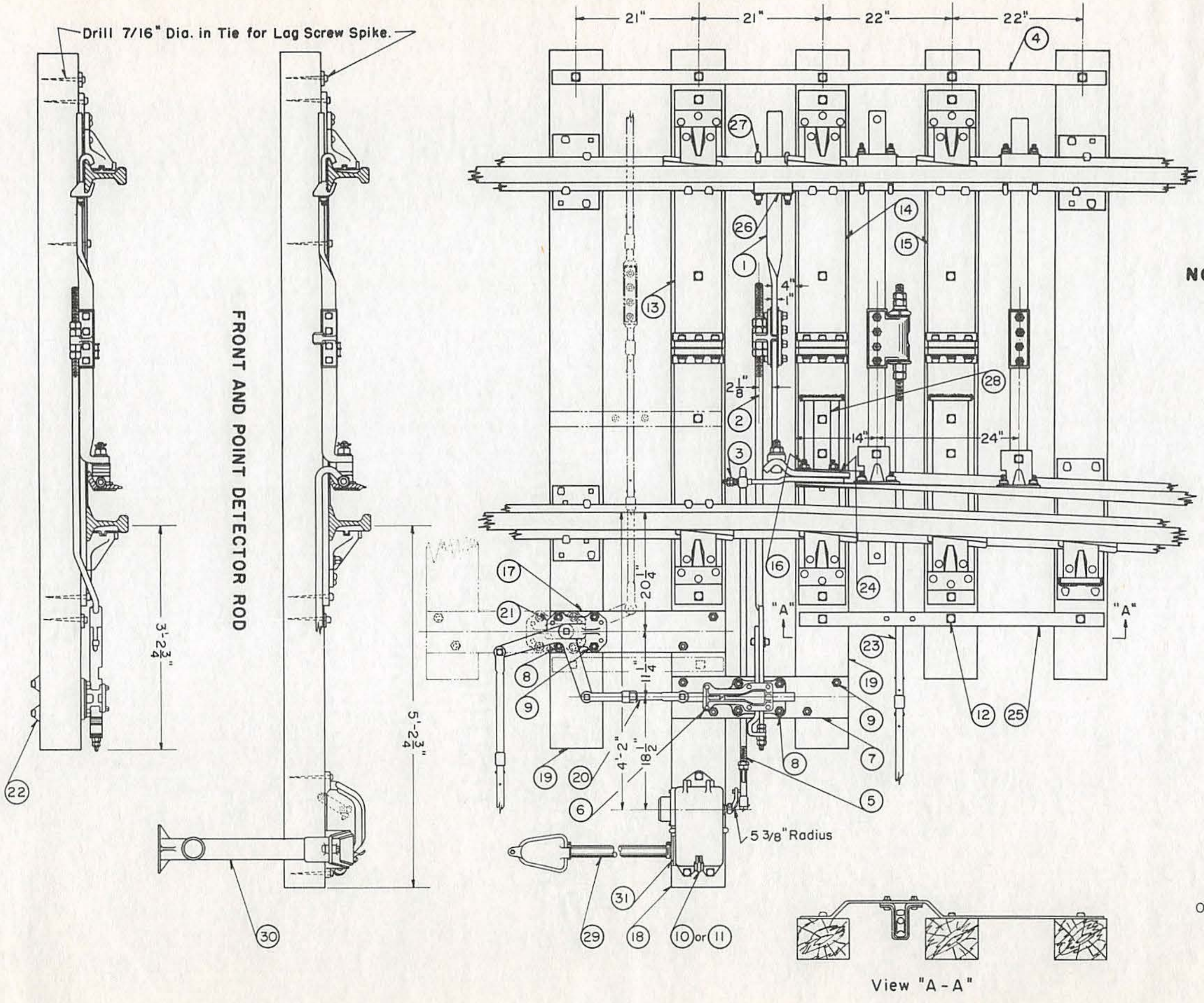
ITEM	NUMBER	REQ'D.	NAME	MF'G.	REF.	DRAWING
1	1341	10	CAP	N.A.C.	2143	214-C
2	1342	10	SUPPORT	"	2142	"
3	1343	10	CAP SCREW WITH LOCK WASHER	"	2143	"
4	1344	5	DETECTOR ARM	"	2141	
5	1345	10	CAST WASHER (CRERAR, ADAMS & CO.)		40	Pg. 382
6	1346	2	CONNECTOR	N.A.C.	2147	214-C
7	1347	10	3/4" DIA. X 11" LONG MACH. BOLTS			
8	1348	4	CONNECTOR	N.A.C.	2146	214-C
9	1544-3	10	STD. 3/4" HEX. NUT			
10	135	2	RACO BOOTLEGS	RACO	445-1	446
11	1542-3	20	STD. 1/2" HEX. NUT			
12	1289-2	4	1/2" X 2" COPPERWELD STAPLES, ROLLED POINTS		RP96	CAT.
13	1349	10	STD. 3/4" LOCK WASHERS			
14	1542-2	20	STD. 1/2" LOCK WASHERS			

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
DRAGGING EQUIPMENT DETECTOR
DETAILS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 9, 1947

SHEET NO. 2

S-134



Drill 7/16" Dia. in Tie for Lag Screw Spike.
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
3'-2 3/4"
5'-2 3/4"
21"
21"
22"
22"
4" 1"
2 1/8"
14"
24"
20 1/4"
11 1/4"
4'-2"
18 1/2"
5 3/8" Radius
"A"
"A"
View "A - A"
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩ or ⑪
⑫
⑬
⑭
⑮
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NOTES:

Pipe Line for F.P.L. must be in tension when Derail is Locked.

Arrangement shown by view "A-A" may be used where it is possible to avoid the use of pipe carrier foundation between Derail Layout and pipe line.

Circuit Controller Crank shall be 5-3/8" long in accordance with Fig. F, Plate K0143 GRS.CO.

When securing Switch Circuit Controller to tie Lag Screw Spikes MUST BE SCREWED INSTEAD OF DRIVEN.

Use Tie Strap No. 1531-4 when pipeline arrangement shown in dotted lines for F.P.L. is used.

Approved: CBHarvey
Chief Eng'r Maintenance

Approved: A G Auer
Chief Eng'r Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
LAYOUT FOR MECHANICAL SPLIT SWITCH DERAIL
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
July 28, 1950

Adopted 5-15-5
Revised 4-11-52.

Sheet No. 1

S-135-A

MATERIAL LIST FOR SPLIT SWITCH DERAIL

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1	2130	1	Swivel Type Front Rod for Split Switch Derail.	S-213
2	1830	1	Lock Rod Assembly.	S-183 (Sh.1)
3	1532	1	Switch Circuit Controller Lug Assembly.	S-153 (Sh.1)
4	1531-2	1	$2\frac{1}{2}$" x $\frac{1}{2}$" x 7'-10" Long Tie Strap.	S-153 (Sh.1)
5	1820	1	Switch Circuit Controller Rod Assembly.	S-182 (Sh.1)
6	14253	1	Plunger Switch Lock.	S-388
7	1530	1	Base Plate for Plunger Switch Lock.	S-153 (Sh.1)
8		6	$\frac{3}{4}$"-10 x $2\frac{1}{4}$" Long Sq. Hd. Machine Bolt with Hex. Nut and Spring Washer.	
9		8	$\frac{3}{4}$"-10 x $10\frac{1}{4}$" " " " " " " " " " " " .	
10			Model 7 Switch Circuit Controller, 4-way 2pos. complete Dwg. 53530-4 Gr. 51 G.R.S. Co.	
11			" " " " " 6-way 2pos. " " 53530-9 Gr. 12 "	
12	13811	27	Galvanized Lag Screw Spike.	S-382
13		1	No. 1 Insulated Gauge Plate Assembly.	37020
14		1	No. 2 " " " " .	37020
15		1	No. 3 " " " " .	37020
16	1541	2	Front Foot Bolt Assembly.	S-154
17	1530-1	1	Base Plate for Horizontal Crank Stand.	S-153 (Sh.1)
18		1	8" x 9" x 12'-0" Long Sawed Oak Tie.	
19		2	8" x 9" x 10-0" " " " " .	
20	101910	1	Adjustable Link (Except 16" from ℄ of hole in Screw Jaw to ℄ of hole in Solid Jaw.)	S-304
21	10116	1	One way Horizontal Crank Stand Assembly.	S-315
22	C12398	8	Cast-Iron Washers.	S-76140-A
23	1841	1	Operating Rod Assembly.	S-184 (Sh.1)
24	125512	1	Switch Circuit Controller Lug Plate.	S-364
25	1531-1	1	$2\frac{1}{2}$" x $\frac{1}{2}$" x 4'-4" Long Tie Strap.	S-153 (Sh.1)
26		1	Rod Guide	35790
27		2	Hook Bolts	35790
28	15316	1	Stop Plate	S-153 (Sh.1)
29	15312	1	Rubber Conduit Assembly using 1535	S-153 (Sh.2)
30	2283	1	8-way Junction Box Assembly	S-228 (Sh.3)
31	1538	1	No. 464-32 Raco Hose Adapter Assembly	S-153 (Sh.2)

NOTE:

When ordering Insulated Gauge Plates specify weight and section of rail. Chief Engineer Maintenance Drawing No. 37020.

When ordering Hook Bolts specify weight and section of rail Chief Engineer Maintenance Drawing No. 35790.

Approved: ____________
Chief Eng'r. Maintenance

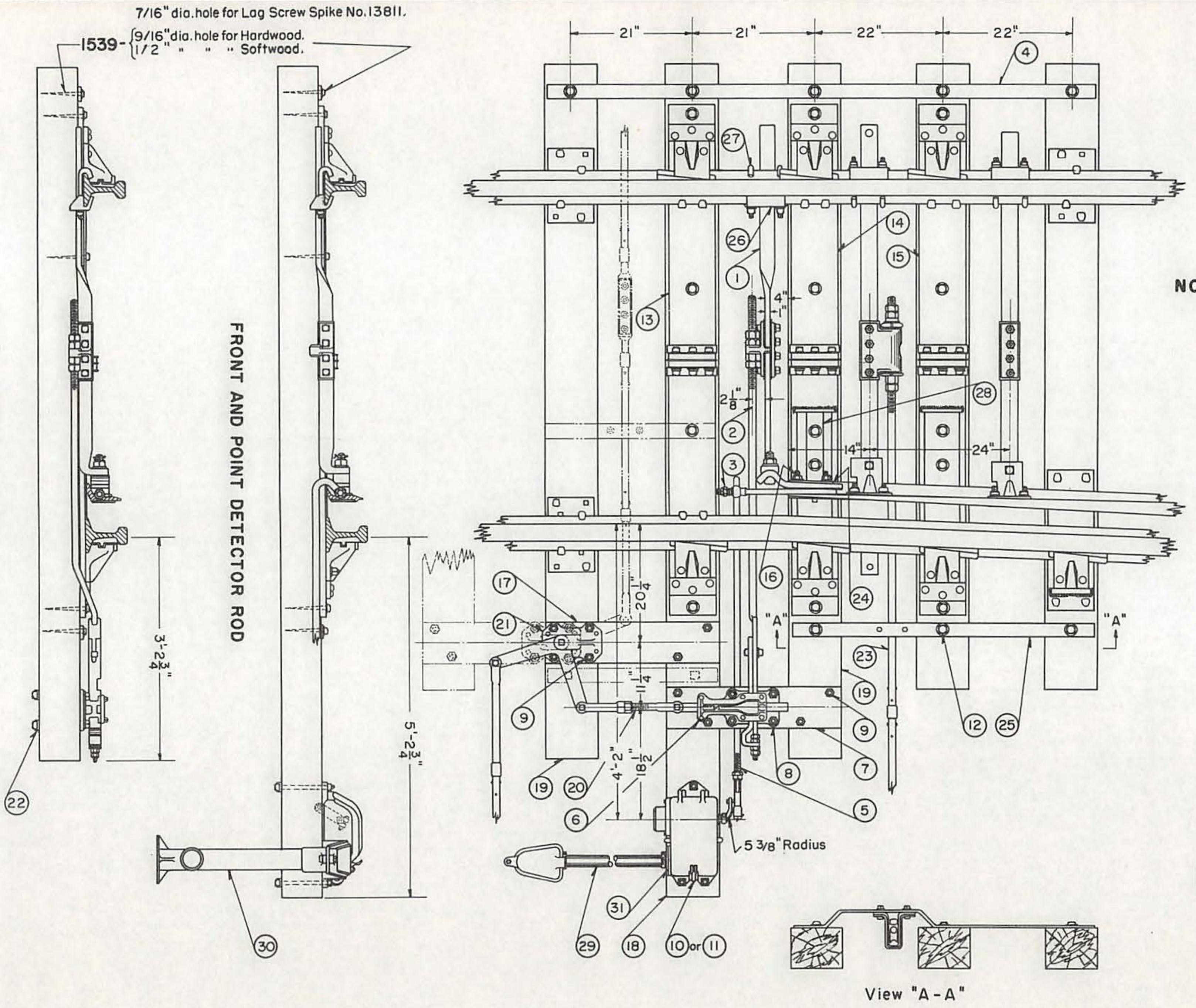
Approved: ____________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR MECHANICAL
SPLIT SWITCH DERAIL
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
July 31, 1950.

Revised: 3-11-52.

Sheet No. 2

S-135-A


7/16" dia. hole for Lag Screw Spike No.13811.
1539- 9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
3'-2 3/4"
5'-2 3/4"
21"
21"
22"
22"
4"
1"
2 1/8"
14"
24"
20 1/4"
11 1/4"
18 1/2"
4'-2"
5 3/8" Radius
"A"
"A"
1
2
3
4
5
6
7
8
9
9
10 or 11
12
13
14
15
16
17
18
19
19
20
21
22
23
24
25
26
27
28
29
30
31
View "A-A"

NOTES:

Pipe Line for F.P.L. must be in tension when Derail is Locked.

Arrangement shown by view "A-A" may be used where it is possible to avoid the use of pipe carrier foundation between Derail Layout and pipe line.

Circuit Controller Crank shall be 5-3/8" long in accordance with Fig. F, Plate K0143 GRS.CO.

Use Tie Strap No. 1531-4 when pipe line arrangement shown in dotted lines for F.P.L. is used.

Approved: ____________
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LAYOUT FOR MECHANICAL SPLIT SWITCH DERAIL
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Made & Corrected 7-28-50.
Adopted 5-15-51.
Revised 4-11-52.
Revised 3-15-54: Lag screws changed.
Revised 4-5-56: Items 26 & 27 revised.
Revised 1-13-59: 1532 & 1532-1 rev.

Sheet No. 1

S-135-F

MATERIAL LIST FOR SPLIT SWITCH DERAIL

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1	2130	1	Swivel Type Front Rod for Split Switch Derail.	S-213-A
2	1830	1	Lock Rod Assembly.	S-183-D,sh.1
3	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H,sh.1
4	1531-2	1	$2\frac{1}{2}$" x $\frac{1}{2}$" x 7'-10" Long Tie Strap.	S-153-H,sh.1
5	1820	1	Switch Circuit Controller Rod Assembly.	S-182-B,sh.1
6	14253	1	Plunger Switch Lock.	S-388
7	1530	1	Base Plate for Plunger Switch Lock.	S-153-H,sh.1
8		4	$\frac{3}{4}$"-10 x $2\frac{1}{4}$" Long Sq. Hd. Machine Bolt with Hex. Nut and Spring Washer.	
9		13	$\frac{3}{4}$"-10 x 10" " " " " " " " " " " "	
10			Model 7 Switch Circuit Controller, 4-way 2pos. complete Dwg. 53530-4 Gr. 51 G.R.S. Co.	
11			" " " " " 6-way 2pos. " " 53530-9 Gr. 12 "	
12	1539	24	Galvanized Drive Spike	S-153-H, Sh.2
13		1	No. 1 Insulated Gauge Plate Assembly. (Shown on Pg. 207 Roadway & Track Standard Book.)	37020
14		1	No. 2 " " " " " " " " " " " " "	37020
15		1	No. 3 " " " " " " " " " " " " "	37020
16	1541	2	Front Foot Bolt Assembly.	S-154-E,sh.1
17	1530-1	1	Base Plate for Horizontal Crank Stand.	S-153-H,sh.1
18		1	8" x 9" x 12'-0" Long Sawed Oak Tie.	
19		2	8" x 9" x 10-0" " " " "	
20	15318	1	Adjustable Link	S-153-H,sh.3
21	10116	1	One way Horizontal Crank Stand Assembly.	S-315
22	15320	13	Raco Bolt Grip for 3/4" dia. Bolt.	S-153-H,sh.3
23	1841	1	Operating Rod Assembly.	S-184-D,sh.1
24	125512	1	Switch Circuit Controller Lug Plate.	S-364
25	1531-1	1	$2\frac{1}{2}$" x $\frac{1}{2}$" x 4'-4" Long Tie Strap.	S-153-H,sh.1
26		1	Rod Guide (Shown on Pg. 62 Roadway & Track Standard Book)	35790
27		2	Hook Bolts (Shown on Pg. 62 Roadway & Track Standard Book)	35790
28	15316	1	Stop Plate	S-153-H,sh.1
29	15312	1	Rubber Conduit Assembly using 1535	S-153-H,sh.2
30	2281	1	8-way Junction Box Assembly	S-228-A,sh.1
31	1538	1	No. 464-32 Raco Hose Adapter Assembly	S-153-H,sh.2

NOTE:

When ordering Insulated Gauge Plates specify weight and section of rail. Chief Engineer Construction & Maintenance Drawing No. 37020.

When ordering Hook Bolts specify weight and section of rail Chief Engineer Construction & Maintenance Drawing No. 35790.

Approved: A. Riley
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

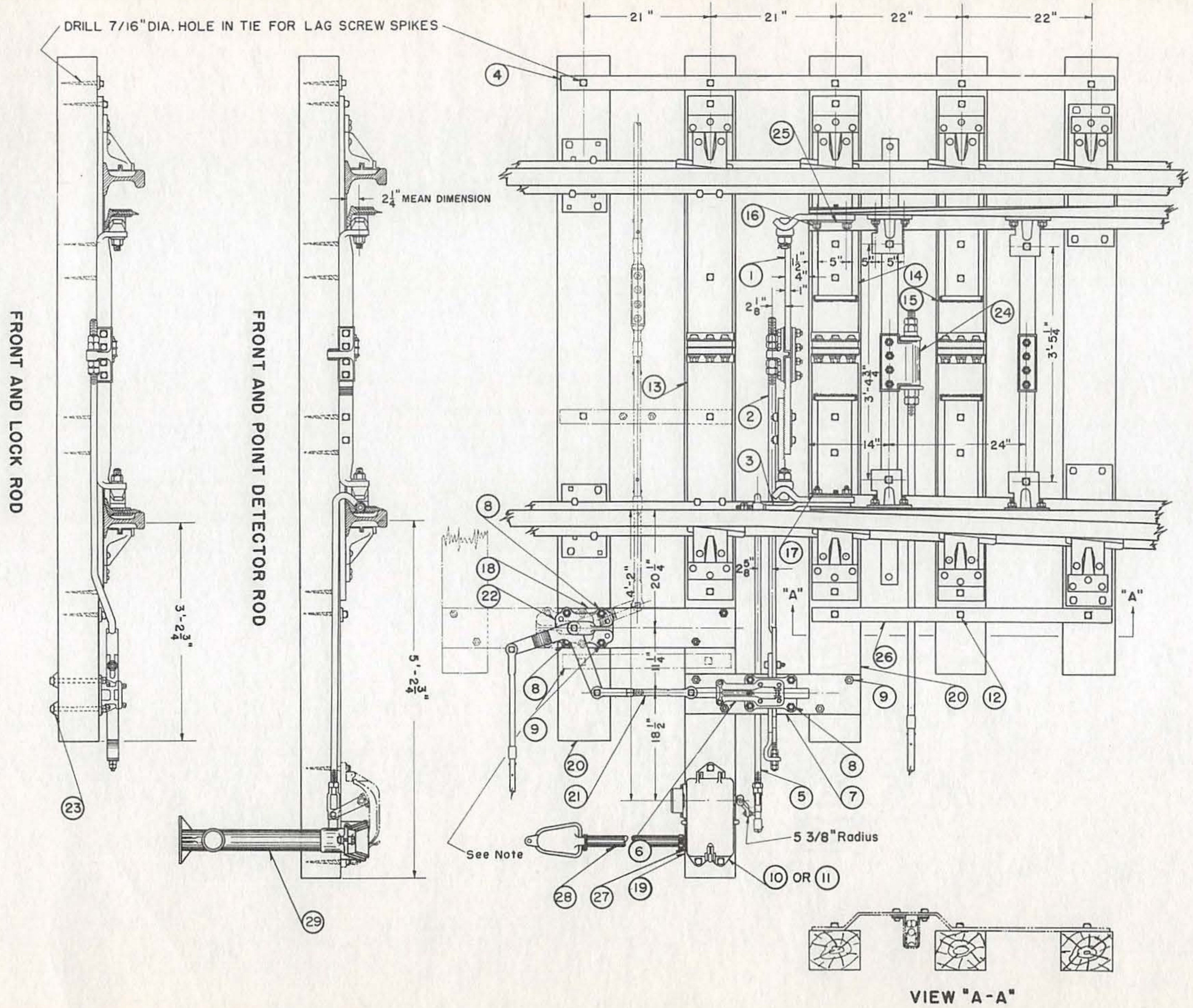
BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR MECHANICAL
SPLIT SWITCH DERAIL
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959.

Made & Corrected: 7-31-50.
Revised 3:11:52.
Revised: 3:15:54 - account changing Lag Screws.
Revised: 4:5:56 - Items 26 & 27 revised.
Revised: 3:4:57.
Revised: 1-13-59: 1532 & 1532-1 rev.

Sheet No. 2

S-135-F

ADOPTED-12-10-47
Revised 1-6-50, account Gauge Plate Assembly, and Drive Spikes changed to A.A.R. Lag Screws.
Revised-3-31-52.


DRILL 7/16" DIA. HOLE IN TIE FOR LAG SCREW SPIKES
21"
21"
22"
22"
2¼" MEAN DIMENSION
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
3'-2¾"
5'-2¾"
1½"
4"
1"
5"
5"
5"
2⅛"
3'-4¾"
3'-5¼"
14"
24"
2⅝"
4'-2"
20¼"
11¼"
18½"
"A"
"A"
5 3/8" Radius
See Note
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ OR ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖ ㉗ ㉘ ㉙
VIEW "A-A"

NOTES:-

PIPE LINE FOR F.P.L. MUST BE IN TENSION WHEN SWITCH IS LOCKED.

ARRANGEMENT SHOWN BY VIEW "A-A" MAY BE USED WHERE IT IS POSSIBLE TO AVOID THE USE OF PIPE CARRIER FOUNDATION BETWEEN SWITCH LAYOUT AND PIPE LINE.

CIRCUIT CONTROLLER CRANK SHALL BE 5⅜" LONG IN ACCORDANCE WITH FIG. F PLATE K0143 G.R.S.CO.

SWITCH CIRCUIT CONTROLLER SHALL BE INSTALLED ON NORMALLY CLOSED POINT SIDE OF TRACK AS SHOWN, EXCEPT WHERE THE ARRANGEMENT IS SUCH THAT THE SWITCH CIRCUIT CONTROLLER MUST BE INSTALLED ON THE NORMALLY OPEN POINT SIDE, IN WHICH EVENT THE SWITCH CIRCUIT CONTROLLER SHALL BE CONNECTED TO THE NORMALLY CLOSED POINT.

WHEN SECURING SWITCH CIRCUIT CONTROLLER TO TIE, LAG SCREW SPIKES MUST BE SCREWED INSTEAD OF DRIVEN.

USE TIE STRAP NO. 1531-4 WHEN PIPE LINE ARRANGEMENT SHOWN IN DOTTED LINES FOR F.P.L. IS USED.

APPROVED: ______________
CHIEF ENG'R. MAINTENANCE

APPROVED: ______________
CHIEF ENG'R. COMM.& SIGS.

BALTIMORE & OHIO RAILROAD
MECHANICAL SWITCH LAYOUT USING SWIVEL TYPE FRONT ROD
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 14, 1947

SHEET NO. 1

S-136-B

MATERIAL LIST FOR MECHANICAL SWITCH USING SWIVEL TYPE FRONT ROD

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163
2	1830	1	LOCK ROD ASSEMBLY	S-183 (SH.1)
3	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153 (SH.1)
4	1531-2	1	2½" X ½" X 7'-10" LONG TIE STRAP	S-153 (SH.1)
5	1820	1	SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY	S-182 (SH.1)
6	14253	1	PLUNGER SWITCH LOCK	S-388
7	1530	1	BASE PLATE FOR PLUNGER SWITCH LOCK	S-153 (SH.1)
8		6	¾" DIA. X 2¼" LONG SQ.HD. HEX.NUT MACHINE BOLTS WITH SPRING WASHERS	
9		8	¾" DIA. X 10¼" " " " " " " " " "	
10			MODEL 7 SW. CIR. CONTROLLER, 4 WAY-2 POS. COMPLETE. DWG. 53530-4 GR.51 G.R.S.CO.	
11			" " " " " 6 WAY-2 POS. " " 53530-9 GR.12 "	
12	13811	27	GALVANIZED LAG SCREW SPIKE	S-382
13		1	NO. 1 INSULATED GAUGE PLATE ASSEMBLY	37020
14		1	NO. 2 " " "	37020
15		1	NO. 3 " " "	37020
16	1540	2	FRONT FOOT BOLT ASSEMBLY	S-154 (SH.1)
17	1541	2	" " " "	S-154 (SH.1)
18	1530-1	1	BASE PLATE FOR HORIZONTAL CRANK STAND	S-153 (SH.1)
19		1	7" X 9" X 12'-0" LONG SAWED OAK TIE	
20		2	7" X 9" X 10'-0" LONG SAWED OAK TIE	
21	101910	1	ADJUSTABLE LINK (Except 16" from ℄ of hole in Screw Jaw to ℄ of hole in Solid Jaw.)	S-304
22	10116	1	ONE WAY HORIZONTAL CRANK STAND ASSEMBLY	S-315
23	C12398	8	CAST-IRON WASHERS	S-76140-A
24	1841	1	OPERATING ROD ASSEMBLY	S-184 (SH.1)
25	125512	2	SWITCH LUG PLATES	S-364
26	1531-1	1	2½" X ½" X 4'-4" LONG TIE STRAP	S-153 (SH.1)
27	1538	1	NO. 464-32 RACO HOSE ADAPTER ASSEMBLY	S-153 (SH.2).
28	15312	1	RUBBER CONDUIT ASSEMBLY USING 1535.	S-153 (SH.2).
29	2283	1	8-WAY JUNCTION BOX ASSEMBLY. (RACO NO. 517-26)	S-228 (SH.3)

NOTE:

WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT AND SECTION OF RAIL. CHIEF ENGINEER MAINTENANCE DRAWING NO. 37020.

APPROVED:
CHIEF ENG'R. MAINTENANCE

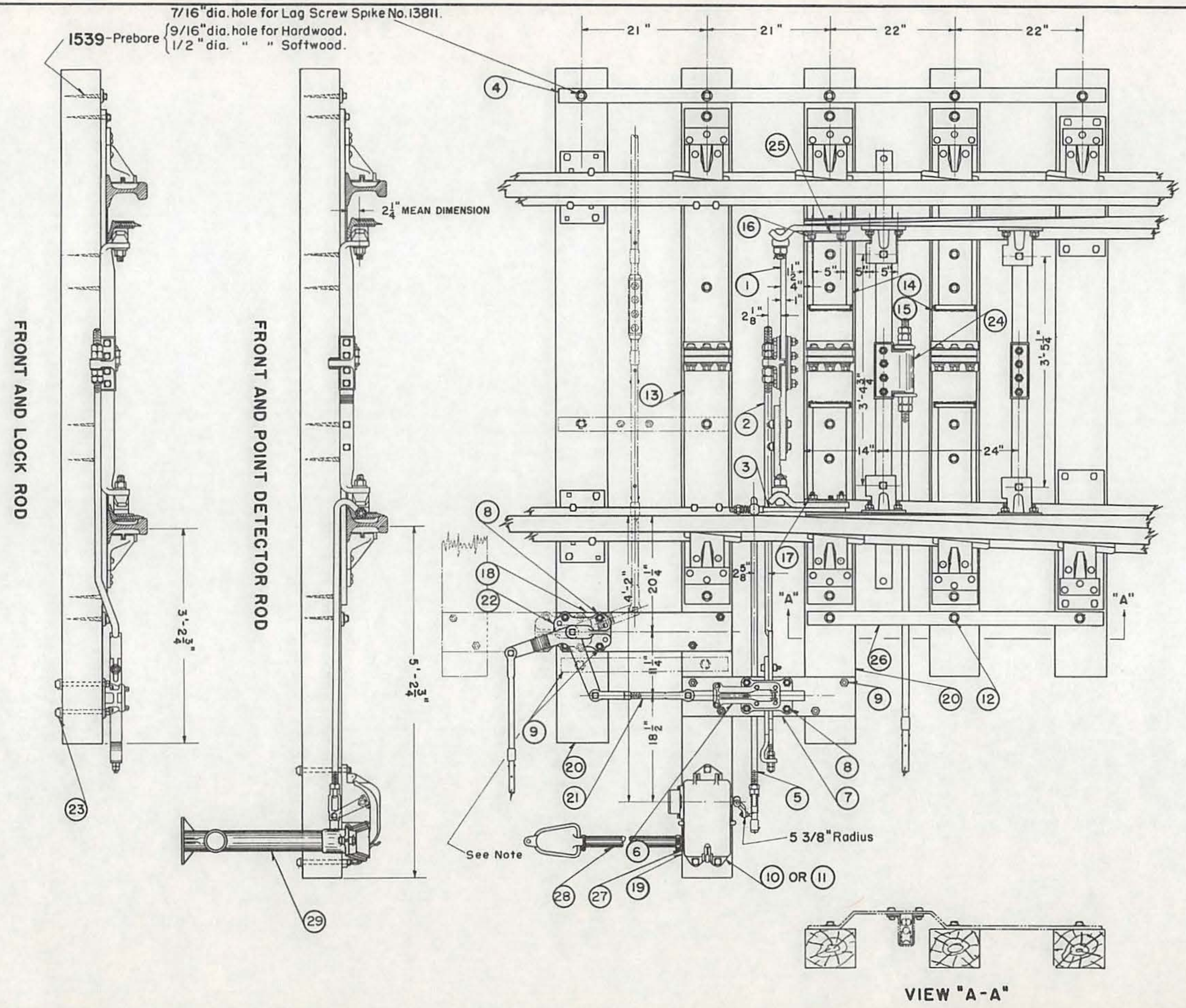
APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR MECHANICAL SWITCH USING SWIVEL TYPE FRONT ROD
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JULY 17, 1947

Revised: 3-31-52.

SHEET NO. 2

S-136-B


7/16"dia. hole for Lag Screw Spike No. 13811.
1539-Prebore
9/16"dia. hole for Hardwood.
1/2"dia. " " Softwood.
21"
21"
22"
22"
2¼" MEAN DIMENSION
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
3'-2¾"
5'-2¾"
4'-2"
20¼"
11¼"
18½"
1½"
4"
1"
5"
5"
2⅛"
3'-4¾"
3'-5¼"
14"
24"
2⅝"
"A"
"A"
5 3/8" Radius
See Note
VIEW "A-A"
1
2
3
4
5
6
7
8
9
10 OR 11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

NOTES:-

PIPE LINE FOR F.P.L. MUST BE IN TENSION WHEN SWITCH IS LOCKED.

ARRANGEMENT SHOWN BY VIEW "A-A" MAY BE USED WHERE IT IS POSSIBLE TO AVOID THE USE OF PIPE CARRIER FOUNDATION BETWEEN SWITCH LAYOUT AND PIPE LINE.

CIRCUIT CONTROLLER CRANK SHALL BE 5⅜" LONG IN ACCORDANCE WITH FIG. F PLATE K0143 G.R.S.CO.

SWITCH CIRCUIT CONTROLLER SHALL BE INSTALLED ON NORMALLY CLOSED POINT SIDE OF TRACK AS SHOWN, EXCEPT WHERE THE ARRANGEMENT IS SUCH THAT THE SWITCH CIRCUIT CONTROLLER MUST BE INSTALLED ON THE NORMALLY OPEN POINT SIDE, IN WHICH EVENT THE SWITCH CIRCUIT CONTROLLER SHALL BE CONNECTED TO THE NORMALLY CLOSED POINT.

USE TIE STRAP NO.1531-4 WHEN PIPE LINE ARRANGEMENT SHOWN IN DOTTED LINES FOR F.P.L. IS USED.

APPROVED: A Riley
Chief Engineer
Construction & Maintenance

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

MECHANICAL SWITCH LAYOUT USING SWIVEL TYPE FRONT ROD

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

SHEET NO. 1

S-136-G

Made & Corrected 7-14-47
Adopted: 12-10-47
Revised 1-6-50, account Gauge Plate Assembly, and Drive Spikes changed to A.A.R. Lag Screws.

Revised: 3-1-52
Revised: 3-16-54 account changing Lag Screws.
Revised: 1-13-59-1532 & 1532-1 rev.

MATERIAL LIST FOR MECHANICAL SWITCH USING SWIVEL TYPE FRONT ROD

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1	1630	1	Swivel Front Rod Assembly.	S-163-C
2	1830	1	Lock Rod Assembly.	S-183-D,sh.1
3	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H,sh.1
4	1531-2	1	2-1/2"x1/2"x7'-10" long Tie Strap.	S-153-H,sh.1
5	1820	1	Switch Circuit Controller Rod Assembly.	S-182-B,sh.1
6	14253	1	Plunger Switch Lock.	S-388
7	1530	1	Base Plate for Plunger Switch Lock.	S-153-H,sh.1
8		4	3/4"Dia.x2-1/4" long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
9		13	3/4"Dia.x 10-1/4" " " " " " " " " " " "	
10		1	Model 7 Sw. Circuit Controller, 4way -2 Pos. complete, Dwg. 53530-4, Gr.51 G.R.S.Co.	
11		1	" " " " " 6way – 2 Pos. " " 53530-9, Gr. 12 "	
12	1539	27	Galvanized Drive Spike.	S-153-H,sh.2
13		1	No. 1 Insulated Gauge Plate Assembly. (Shown on Pg. 207 Roadway & Track Standard Book)	37020
14		1	No.2 " " " " " " " " " " " " "	37020
15		1	No.3 " " " " " " " " " " " " "	37020
16	1540	2	Front Foot Bolt Assembly.	S-154-F,sh.1
17	1541	2	" " " "	S-154-F,sh.1
18	1530-1	1	Base Plate for Horizontal Crank Stand.	S-153-H,sh.1
19		1	7" x 9" x 12'-0" long Sawed Oak Tie.	
20		2	7" x 9" x 10'-0" long Sawed Oak Tie.	
21	15318	1	Adjustable Link.	S-153-H,sh.3
22	10116	1	One Way Horizontal Crank Stand Assembly.	S-315
23	15320	13	Raco Bolt Grip for 3/4" dia. Bolt.	S-153-H,sh.3
24	1841	1	Operating Rod Assembly.	S-184-D,sh.1
25	125512	2	Switch Lug Plates.	S-364
26	1531-1	1	2-1/2"x1/2"x4'-4" long Tie Strap.	S-153-H,sh.1
27	1538	1	No. 464-32 Raco Hose Adapter Assembly.	S-153-H,sh.2
28	15312	1	Rubber Conduit Assembly Using 1535.	S-153-H,sh.2
29	2281	1	8-way Junction Box Assembly (Raco No. 517-27).	S-228-A,sh.1

NOTE:

When ordering Insulated Gauge Plates specify weight and section of rail. Chief Engineer Construction & Maintenance Drawing No. 37020.

Approved: C.Riley
Chief Engineer
Construction & Maintenance

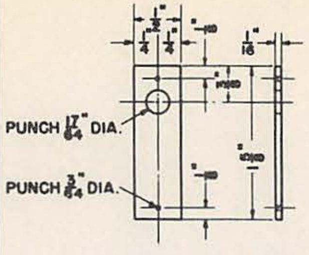
Approved: A.L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR MECHANICAL SWITCH
USING SWIVEL TYPE FRONT ROD
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

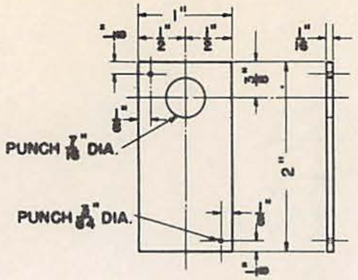
3-16-54: Revised account changing Lag Screws.
3-24-54: Remade & Corrected.
Revised: 3-5-57
1-13-59-1532 & 1532-1 rev.

Sheet No. 2

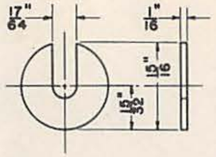
S-136-G


PUNCH 17/64" DIA.
PUNCH 3/64" DIA.

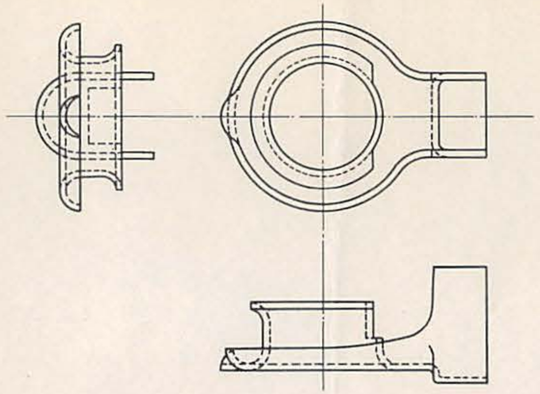
FIBRE TAG -1371


1"
PUNCH 7/16" DIA.
PUNCH 3/64" DIA.
2"

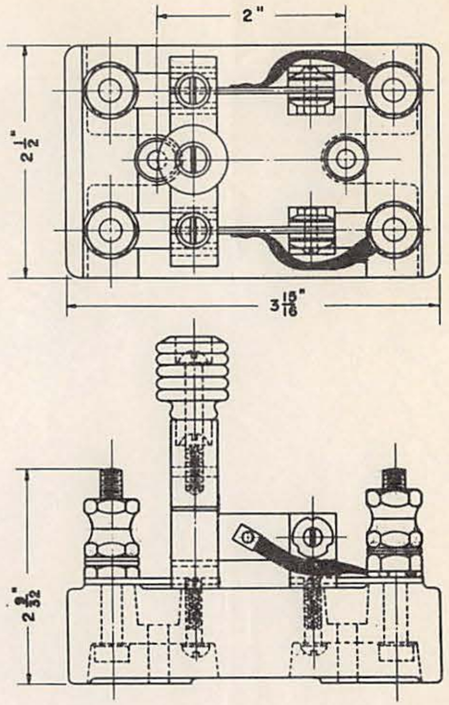
FIBRE TAG - 1372


17/64"
1/16"
15/16"
15/32"

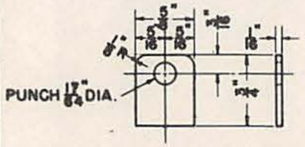
FIBRE TAG - 1371-2



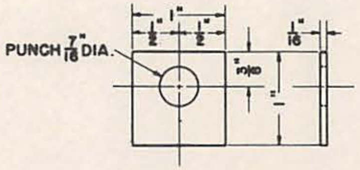
NO. 530-1 RACO BEE WIRE TERMINAL FOR NOS. 14-16-18 AWG.
WIRE WITH O.D. INSULATION 3/16" TO 7/32" - 1378


2"
2 1/2"
3 15/16"
2 9/32"

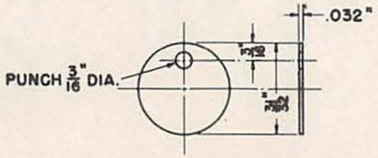
G.R.S. CO. NO. 53615 - DISCONNECTING
SWITCH - 1374


PUNCH 17/64" DIA.

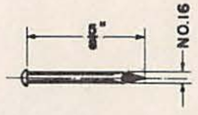
FIBRE TAG - 1371-1


1"
PUNCH 7/16" DIA.

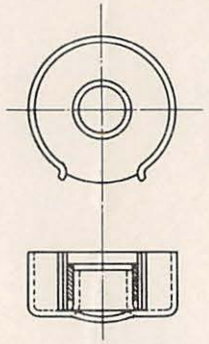
FIBRE TAG - 1372-1


.032"
PUNCH 3/16" DIA.

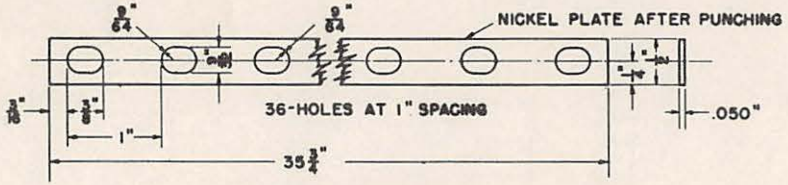
ALUMINUM TAG - 1371-3
NO. 20 AWG.



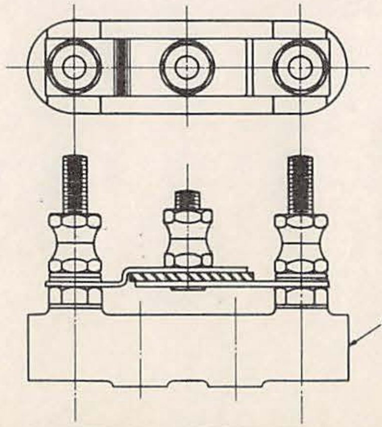
ESCUTCHEON PIN - 1377
BRASS



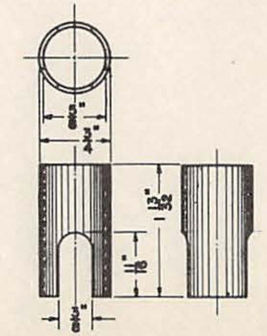
NO. 289-10 RACO CUP TERMINAL COMPLETE - 1379-1


9/64"
9/64"
NICKEL PLATE AFTER PUNCHING
36-HOLES AT 1" SPACING
1"
35 3/4"
.050"

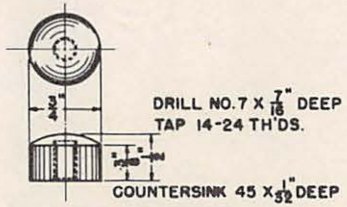
BUS STRIP - 1375
MEDIUM TEMPER COPPER



REF. AA-CHILDERS-GRAHAM TEST TERMINAL ONLY - 1373



TERMINAL POST SLEEVE - 1376-1
BLACK FIBRE


DRILL NO.7 X 7/16" DEEP
TAP 14-24 TH'DS.
COUNTERSINK 45 X 1/32" DEEP

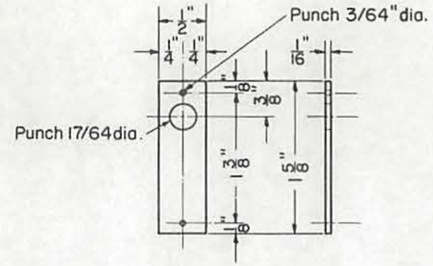
TERMINAL POST CAP - 1376-2
RED BAKELITE

TERMINAL POST SLEEVE & CAP ASSEMBLY - 1376

APPROVED: A.J. Hunt
CHIEF ENG'R. COMM. & SIGS.

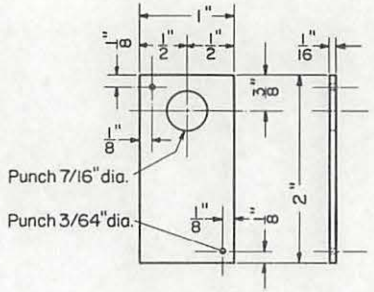
BALTIMORE & OHIO RAILROAD
WIRING ACCESSORIES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 6, 1947

SHEET NO. 1 S-137



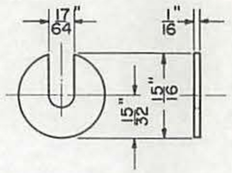
Punch 3/64" dia.
Punch 17/64 dia.
1/2"
1/4"
1/16"
1/8"
3/8"
1 3/8"
1 5/8"

FIBRE TAG - **1371**



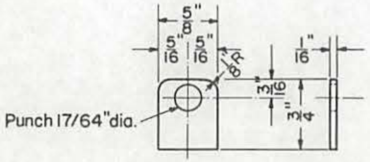
1"
1/2"
1/8"
1/16"
3/8"
2"
Punch 7/16" dia.
Punch 3/64" dia.

FIBRE TAG - **1372**



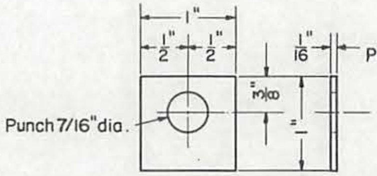
17/64"
1/16"
15/32"
15/16"

FIBRE TAG - **1371-2**



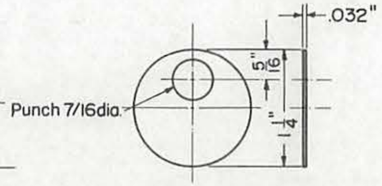
5/8"
5/16"
1/16"
3/16"
3/4"
Punch 17/64" dia.

FIBRE TAG - **1371-1**



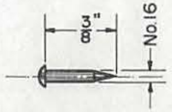
1"
1/2"
1/16"
3/8"
1"
Punch 7/16" dia.

FIBRE TAG - **1372-1**

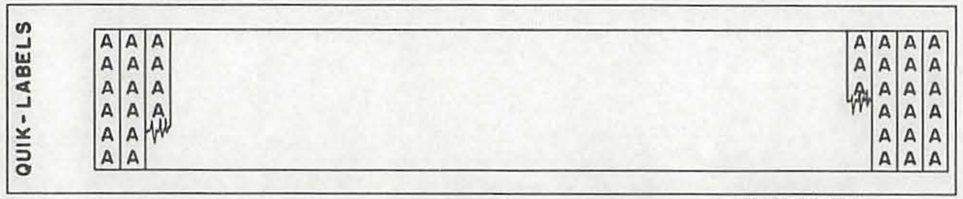


.032"
5/16"
1 1/4"
Punch 7/16 dia.

ALUMINUM TAG - **1371-3**
NO. 20 AWG.

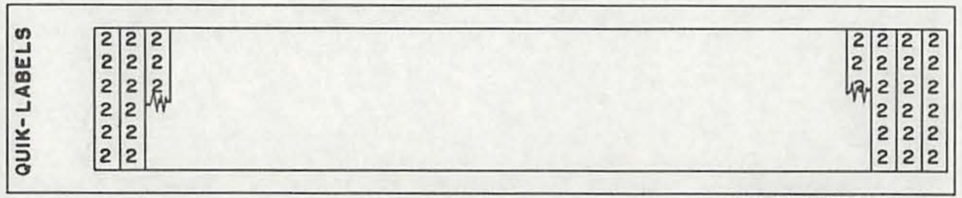


ESCUTCHEON PIN - **1377**
BRASS



QUIK-LABELS
A

QUANTITY	STOCK NO.	STARTING NO.	ENDING NO.	NO. OF STRIPS PER CARD
1	A-A	A	A	33



QUIK-LABELS
2

QUANTITY	STOCK NO.	STARTING NO.	ENDING NO.	NO. OF STRIPS PER CARD
1	2-2	2	2	33

BRADY QUIK-LABELS - **1371-4**

NOTES:

Fibre Tags shall be Black.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
WIRING ACCESSORIES
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Sheet No. 1

S-137-H

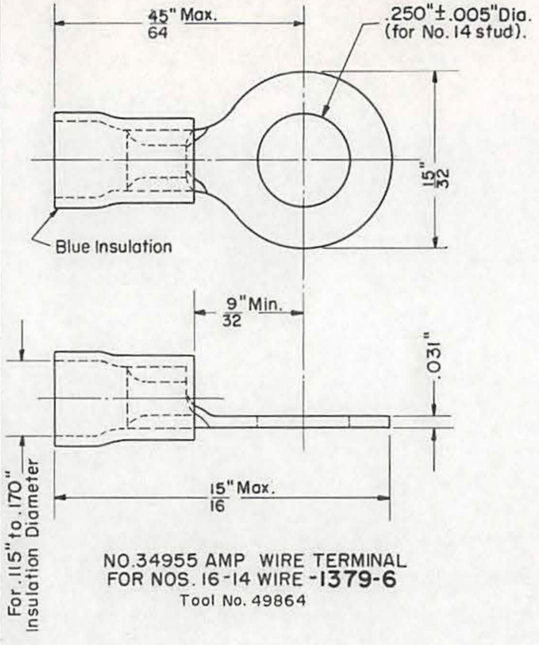
Made & Corrected 12-14-51 account revising Tag 1371-3 & adding 1371-4.
Revised 6-2-58: Fibre Tags made Black.

Revised: 6-2-58 Ter. 1379-1 changed from 289-12 to 289-10 by Raco letter 3-27-57.

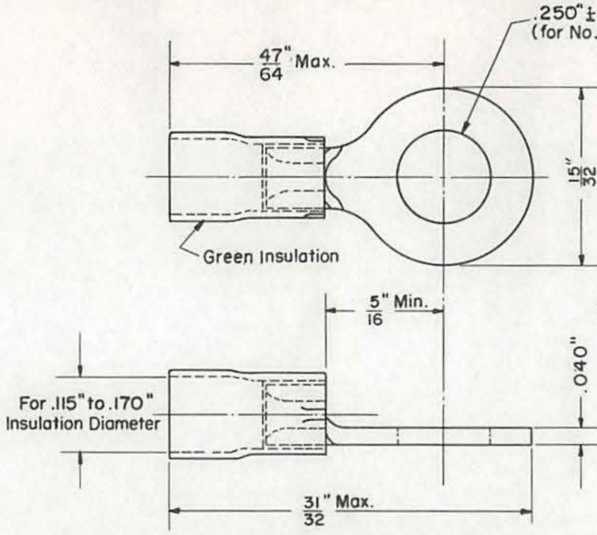
7-5-53: New plan made account adding adding Terminals 1379-7 & 1379-8 - U.S.&S.Co. ordering Ref. on 1379-2 changed.

1-24-56: No. 1379-7&8 Terminals revised.

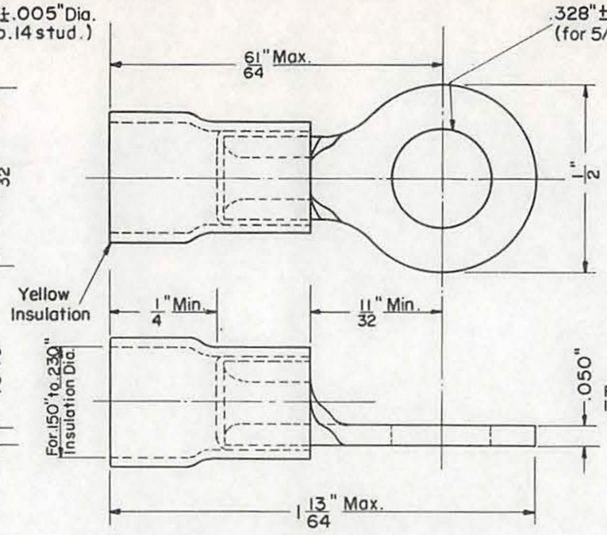
12-26-56: U.S.&S.Co. ordering Ref. on 1379-2 revised.


45/64" Max.
.250" ± .005" Dia. (for No. 14 stud).
15/32"
Blue Insulation
9/32" Min.
.031"
15/16" Max.
For .115" to .170" Insulation Diameter

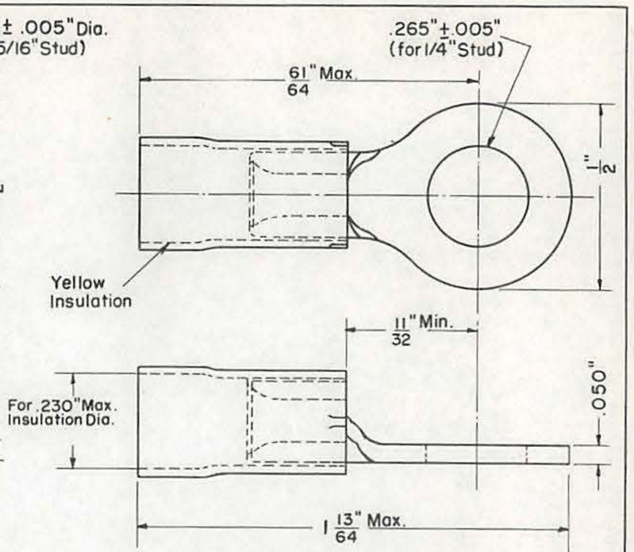
NO. 34955 AMP WIRE TERMINAL FOR NOS. 16-14 WIRE **-1379-6**
Tool No. 49864


47/64" Max.
.250" ± .005" Dia. (for No. 14 stud.)
15/32"
Green Insulation
5/16" Min.
For .115" to .170" Insulation Diameter
.040"
31/32" Max.

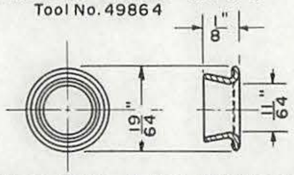
NO. 36273 AMP WIRE TERMINAL FOR NOS. 20-16 WIRE **-1379-5**
Tool No. 49864


61/64" Max.
.328" ± .005" Dia. (for 5/16" Stud)
1/2"
Yellow Insulation
1/4" Min.
11/32" Min.
For .150" to .230" Insulation Dia.
.050"
1 13/64" Max.

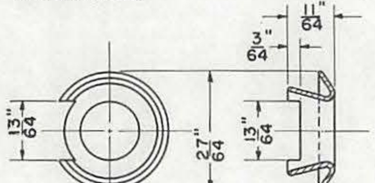
No. P-8646 AMP WIRE TERMINAL FOR NOS. 16-14 WIRE **-1379-7**
Tool No. 59062


61/64" Max.
.265" ± .005" (for 1/4" Stud)
1/2"
Yellow Insulation
11/32" Min.
For .230" Max. Insulation Dia.
.050"
1 13/64" Max.

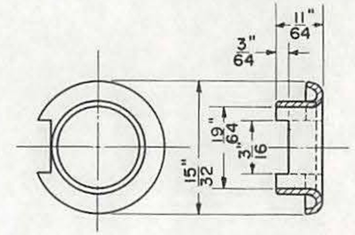
No35349 AMP WIRE TERMINAL FOR NOS. 16-14 WIRE **-1379-8**
Tool No. 59062


1/8"
19/64
11/64

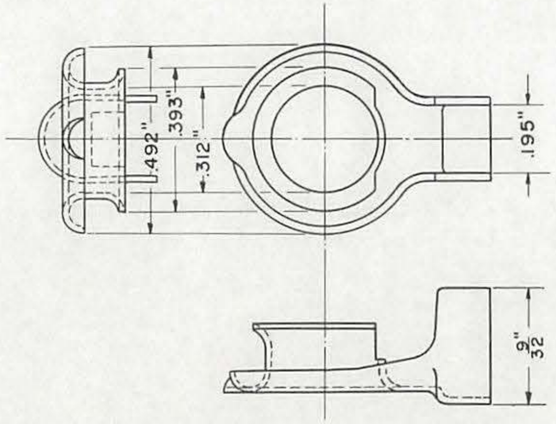
No. 45301, Ref. 2 - Plate P-7090 U.S.&S.Co.
TERMINAL EYELET FOR NO. 6 TERMINAL POST **-1379-2**


11/64"
3/64"
13/64
27/64"
13/64

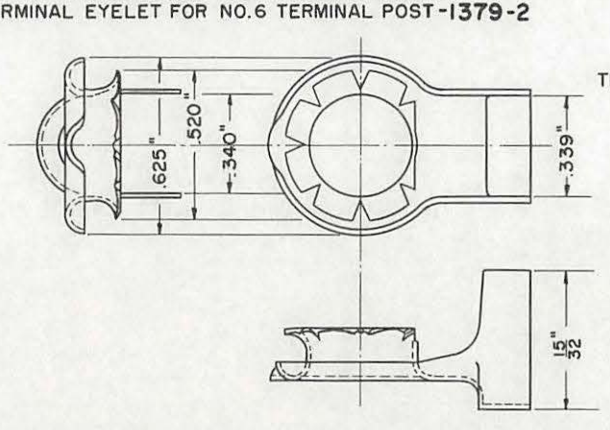
NO. 45302 REF. 3 PLATE P-7090 U.S.&S.CO.
TERMINAL EYELET FOR NO. 8 TERMINAL POST **-1379-3**


11/64"
3/64"
19/64
3/16"
15/32

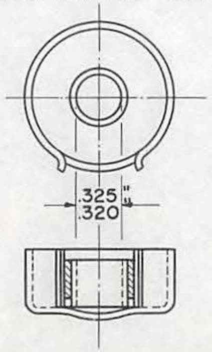
NO. 45304 REF. 6 PLATE P-7090 U.S.&S.CO.
TERMINAL EYELET FOR NOS. 12 or 14 TERMINAL POSTS **-1379-4**


.393"
.492"
.312"
.195"
9/32"

NO. 530-1 RACO BEE WIRE TERMINAL FOR NOS. 14-16-18 AWG. WIRE WITH O.D. INSULATION 3/16" TO 7/32" **- 1378**


.520"
.625"
.340"
.339"
15/32"

NO. 530-3 RACO BEE WIRE TERMINAL FOR NOS. 12 TO 9 AWG. WIRE WITH O.D. INSULATION 7/32" TO 3/8" **- 1378-1**



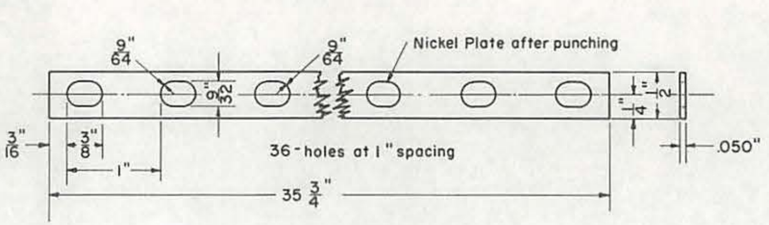
NO. 289-10 RACO CUP TERMINAL COMPLETE **-1379-1**

Approved: A. L. Jordan
Signal Engineer

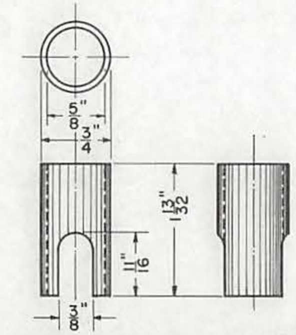
BALTIMORE & OHIO RAILROAD
WIRING ACCESSORIES
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Sheet No. 2

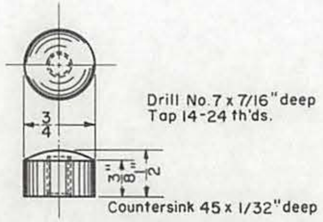
S-137-H


9/64"
9/64"
Nickel Plate after punching
9/32"
1/4"
1/2"
3/16"
3/8"
36-holes at 1" spacing
.050"
1"
35 3/4"

BUS STRIP-**1375**
MEDIUM TEMPER COPPER

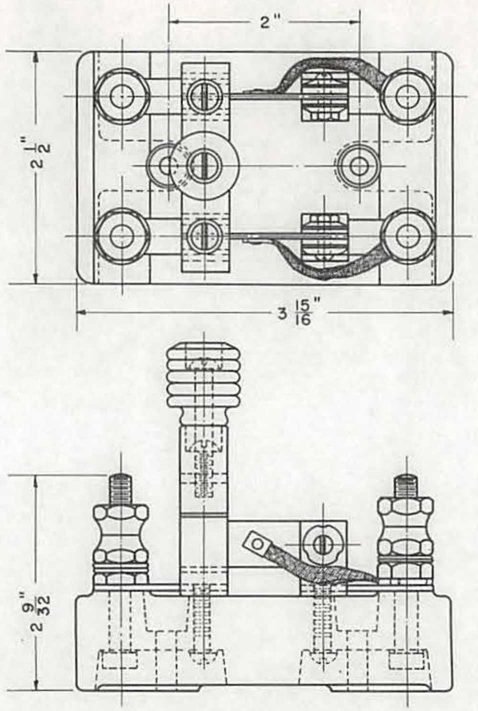

5/8"
3/4"
13/32"
11/16"
3/8"

TERMINAL POST SLEEVE-**1376-1**
BLACK FIBRE

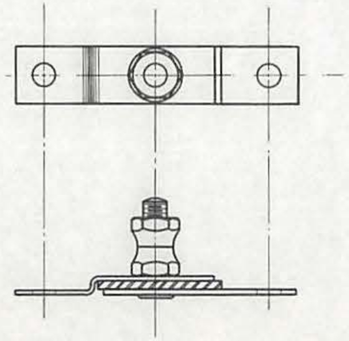

Drill No.7 x 7/16" deep
Tap 14-24 th'ds.
3/4"
3/8"
1/2"
Countersink 45 x 1/32" deep

TERMINAL POST CAP-**1376-2**
RED BAKELITE

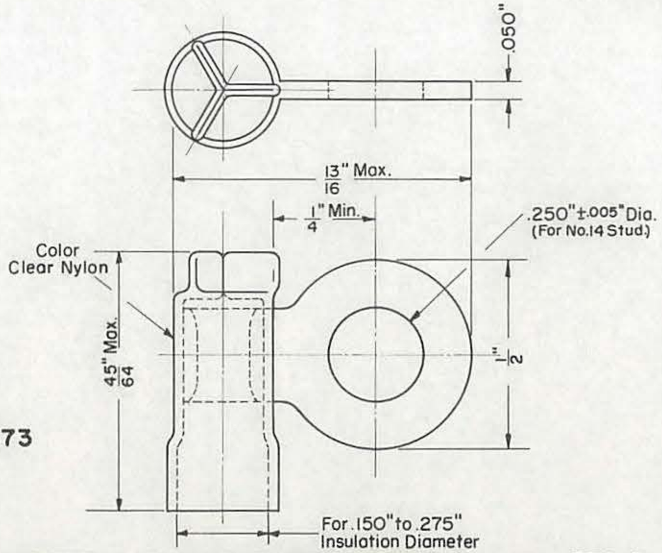
TERMINAL POST SLEEVE & CAP ASSEMBLY-**1376**


2"
2 1/2"
3 15/16"
2 9/32"

G.R.S.CO. NO. 53615 - DISCONNECTING
SWITCH - **1374**



REF. A :- CHILDERS-GRAHAM TEST TERMINAL ONLY - **1373**


.050"
13/16" Max.
1/4" Min.
.250" ±.005" Dia.
(For No.14 Stud)
Color
Clear Nylon
45/64" Max.
1/2"
For .150" to .275"
Insulation Diameter

No.322313 A.I.P. FLAG WIRE TERMINAL FOR NOS. 16-14 WIRE - 1379-9
TOOL No.-48049

3-1-50 New plan made account adding Terminal Nos. 1378-1, 1379-2, 1379-3, & 1379-4.
12-17-51: Sheet No. changed from 2 to 3.
8-26-53 Manufacturers Ref. changed from AA to A on 1373.
3-17-54 Terminal No.1379-9 added.
1-24-56: No.1379-9 Terminal revised.
Revised: 6-2-58

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
WIRING ACCESSORIES
Office of Signal Engineer
Baltimore, Md.
June 2, 1958

Sheet No.3

S-137-H

Revised 10-16-50: File No for she 33 changed from S-128 to S-138.

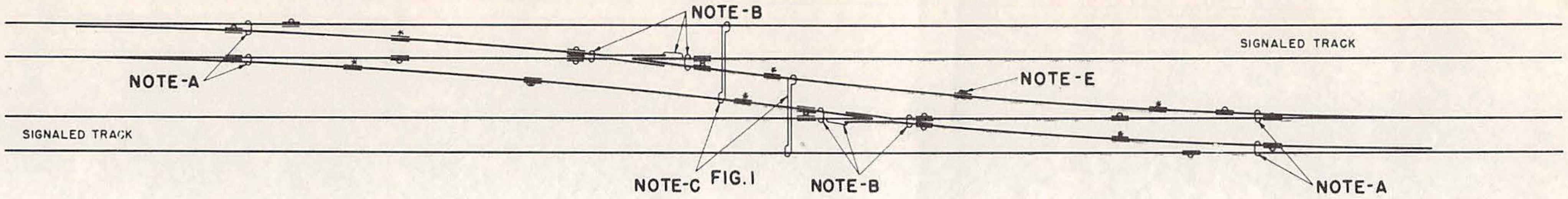

NOTE-B
SIGNALED TRACK
NOTE-A
NOTE-E
SIGNALED TRACK
NOTE-C
NOTE-B
NOTE-A

FIG. I

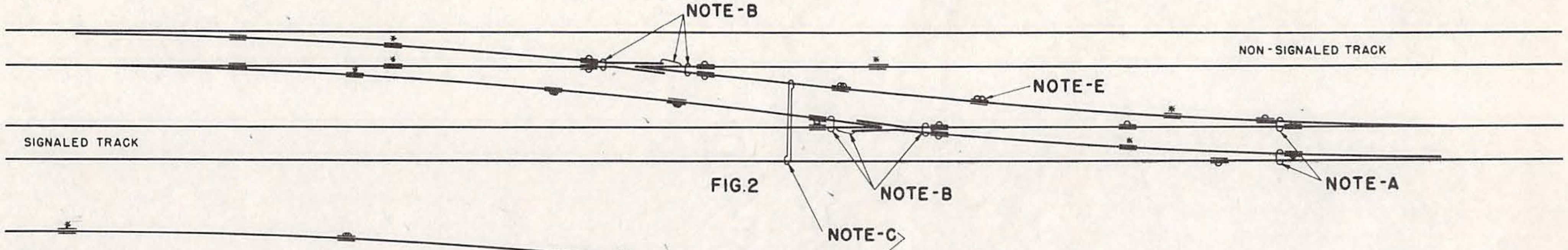

NOTE-B
NON-SIGNALED TRACK
NOTE-E
SIGNALED TRACK
NOTE-B
NOTE-A
NOTE-C

FIG.2

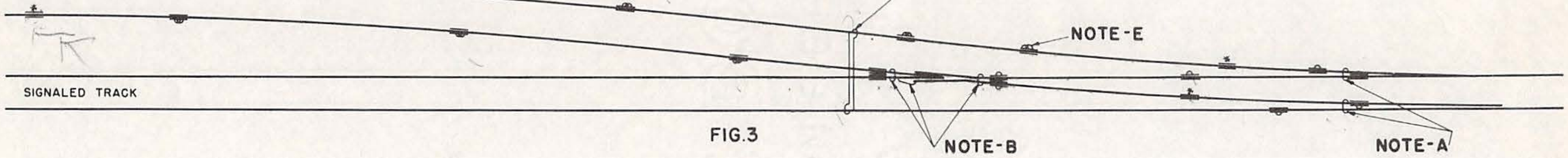

NOTE-E
SIGNALED TRACK
NOTE-B
NOTE-A

FIG.3

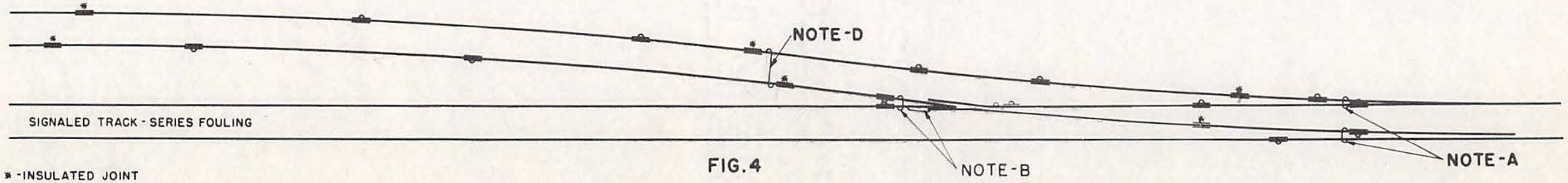

NOTE-D
SIGNALED TRACK - SERIES FOULING
NOTE-B
NOTE-A

FIG.4

* -INSULATED JOINT

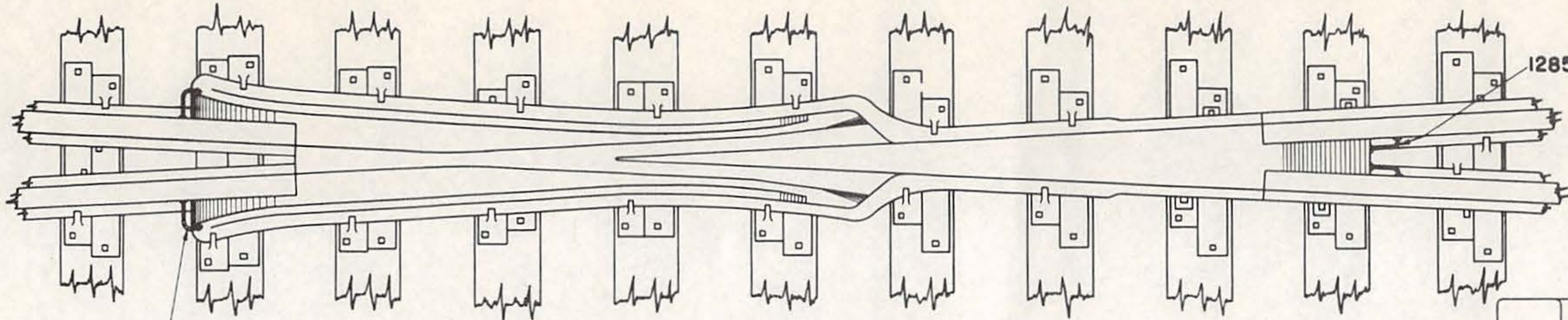
NOTE A - FOR DETAILS OF DUPLEX BOND SEE PLAN S-128, SHEET 3.
NOTE B - FOR DETAILS OF DUPLEX BONDS SEE PLAN S-128, SHEET 2.
NOTE C - FOR DETAILS OF FOULING BOND SEE PLAN S-128, SHEET 3.
NOTE D - FOR DETAILS OF TRANSPOSITION BOND SEE PLAN S-128, SHEET 3.
NOTE E - FOR DETAILS OF DOUBLE BONDING SEE PLAN S-127, SHEET I.

APPROVED: CBHauser
CHIEF ENG'R. MAINTENANCE

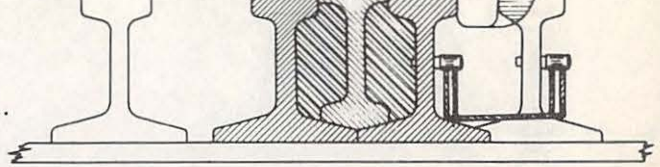
APPROVED: AHHauer
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
AUG. 29, 1946

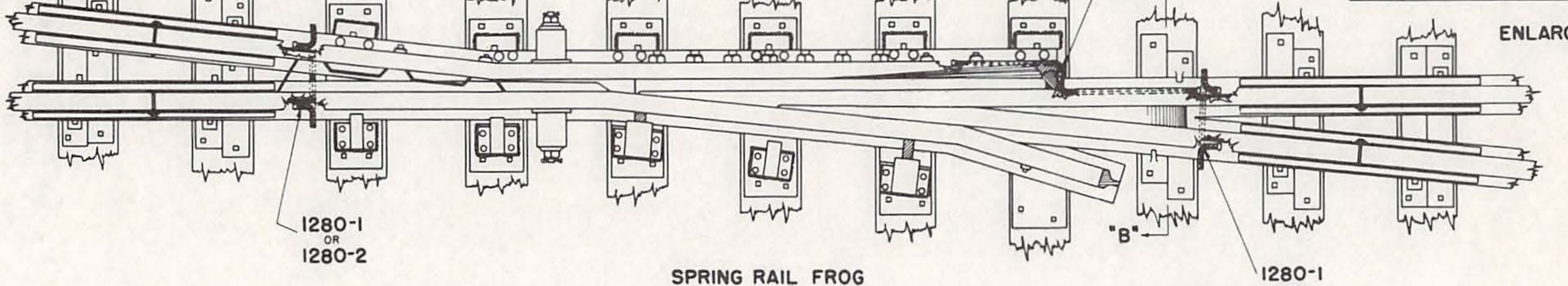
SHEET NO. I
S-138


1285-1
1285-1

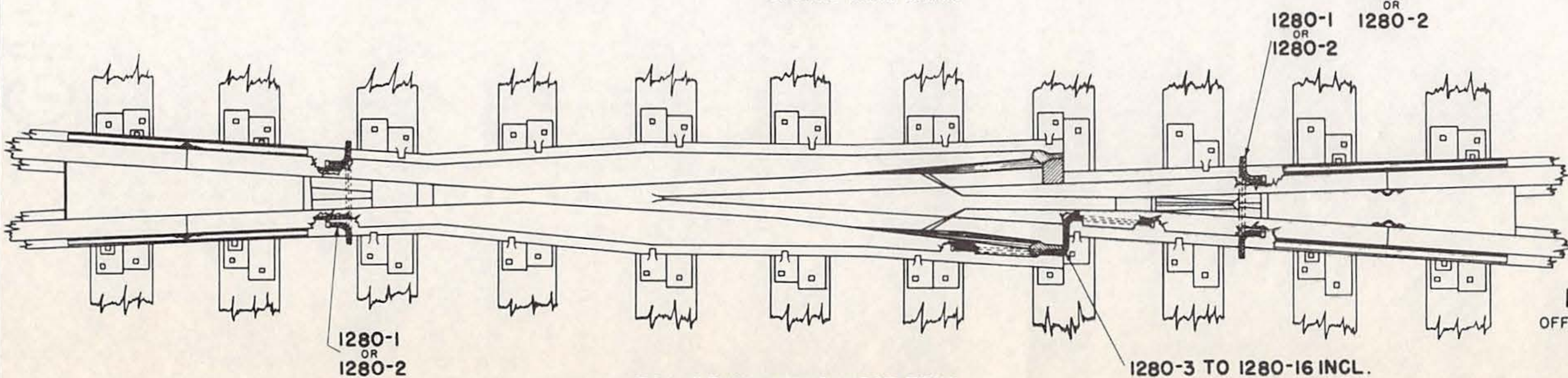
SELF GUARDED SOLID MANGANESE FROG



ENLARGED SECTION "B-B"


1280-3 TO 1280-16 INCL.
"B"
"B"
1280-1 OR 1280-2
1280-1 OR 1280-2

SPRING RAIL FROG


1280-1 OR 1280-2
1280-1 OR 1280-2
1280-3 TO 1280-16 INCL.

RAIL BOUND MANGANESE FROG

APPROVED C.B. Hansen
CHIEF ENG'R. MAINTENANCE

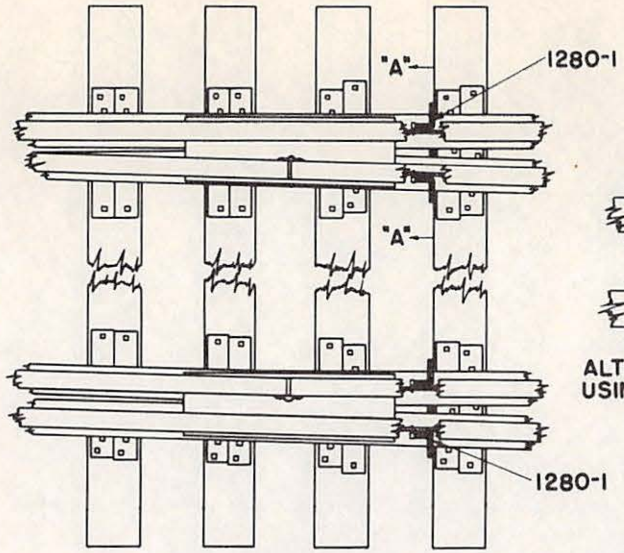
APPROVED
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 11, 1948

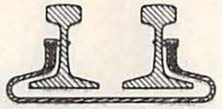
SHEET NO. 2

S-138

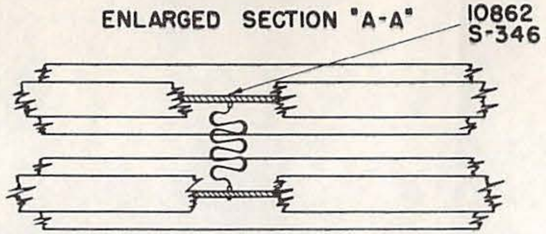
ADOPTED: 3-30-49
Revised 10-16-50: File No. for she &3
changed from S-128 to S-138.


"A"
1280-1
"A"
1280-1

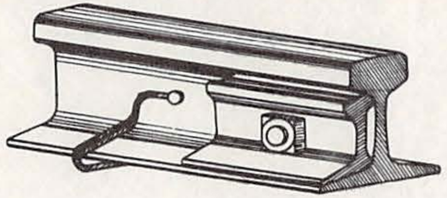
BOND ARRANGEMENT
AT HEEL OF SWITCH



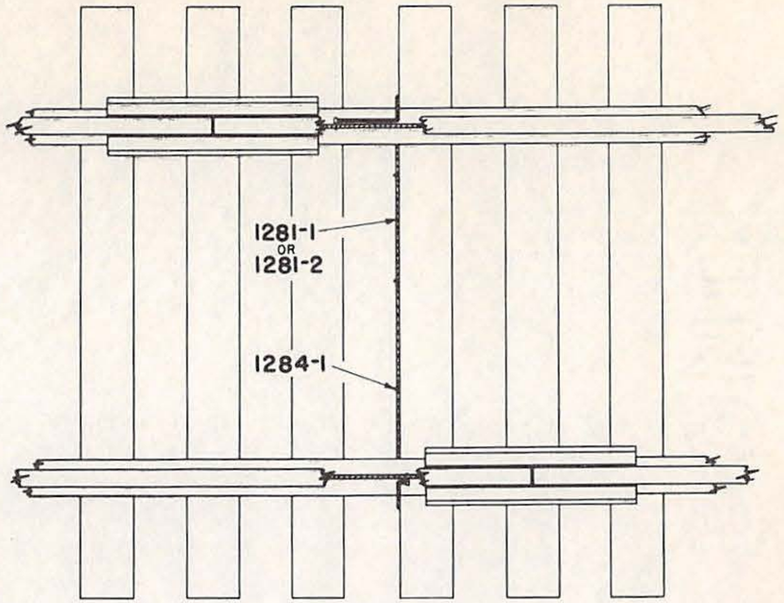
ENLARGED SECTION "A-A"



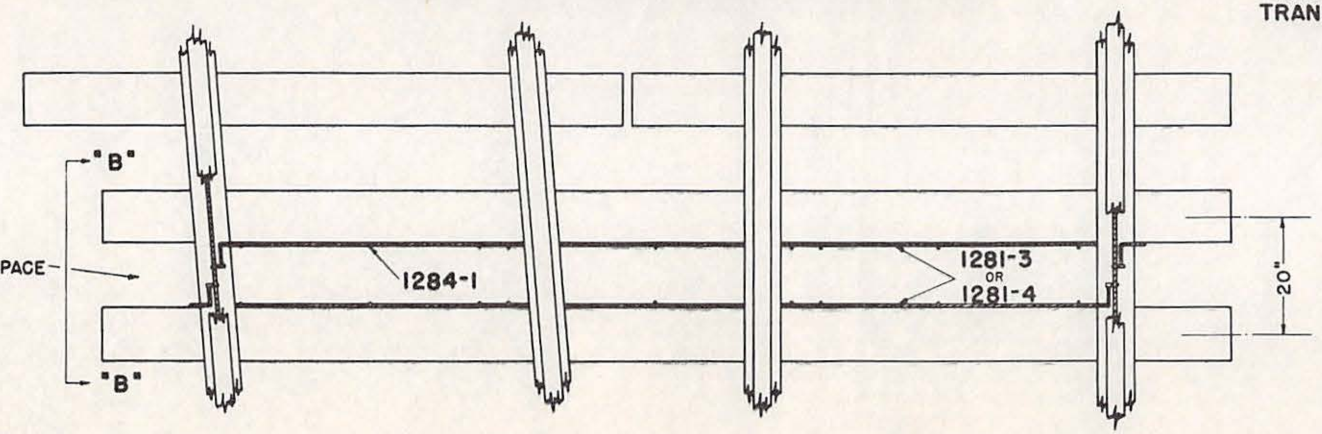
ALTERNATE ARRANGEMENT FOR 1280-1 BOND
USING 2 NO. 6 AWG. COPPERWELD BOND WIRES



ENLARGED VIEW SHOWING FORMING OF DUPLEX BONDS


1281-1
OR
1281-2
1284-1

ARRANGEMENT OF
TRANSPOSITION BOND

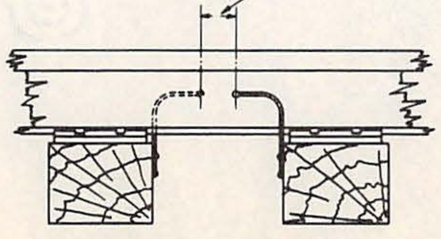

"B"
"B"
ANTI-CREEPERS NOT TO BE USED IN THIS SPACE
1284-1
1281-3
OR
1281-4
20"

NOTE:
STAPLES SHALL NOT BE DRIVEN NEAR TIE PLATES OR SPIKES.

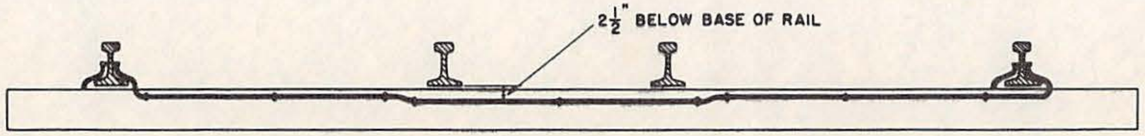
APPROVED ______ CHIEF ENG'R. MAINTENANCE

APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

DRILL CENTERS
3" OR LESS



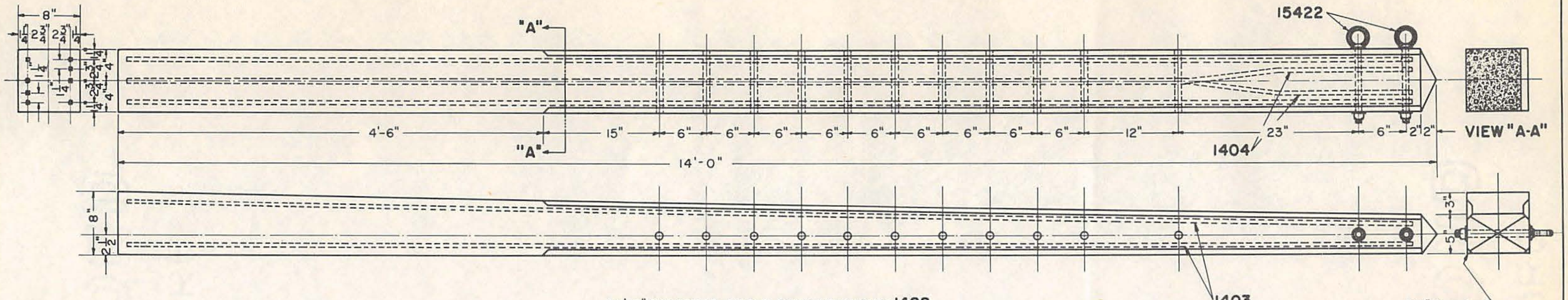
ENLARGED SECTION "B-B"


2½" BELOW BASE OF RAIL

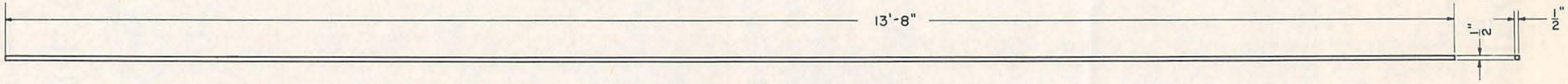
FOULING BOND ARRANGEMENT FOR SWITCHES & TURNOUTS

BALTIMORE & OHIO RAILROAD
FROG & SWITCH BONDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
OCT. 12, 1948

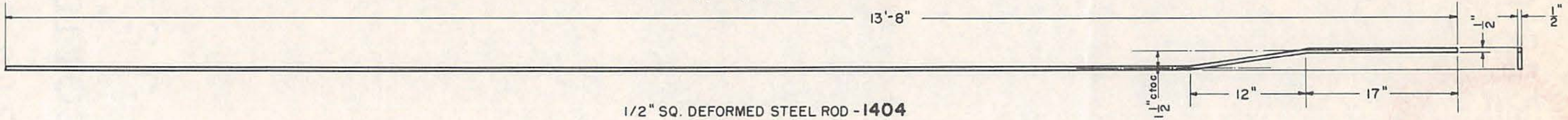
ADOPTED: 3-30-49
Revised 10-16-50: File No. for she
changed from S-128 to S-138.


8"
1/4 2 3/4 2 3/4 1/4
"A"
"A"
15422
4'-6"
15"
6"
12"
23"
2"
14'-0"
1404
VIEW "A-A"
8"
2 1/2"
3"
5"
1403
3/4"Chamfer

14'-0" CONCRETE CABLE POST ASSEMBLY - **1402**



1/2" SQ. DEFORMED STEEL ROD - **1403**
(4 - Required)


13'-8"
1/2"
1/2"
1 1/2" ctoc
12"
17"

1/2" SQ. DEFORMED STEEL ROD - **1404**
(2 - Required)

NOTES

1- All holes cored 7/8" dia.

2- Concrete shall conform to the following,
  - (a) Coarse aggregate shall consist of 3/4" maximum size stone or gravel.
  - (b) Not less than 7 sacks of cement shall be used per cubic yard of concrete.
  - (c) Water content per 94 lb. sack of cement shall not exceed 6 gallons.
  - (d) High frequency vibrator shall be used in compacting concrete.

3- Unless otherwise specified cable post shall be furnished with only one eye bolt.

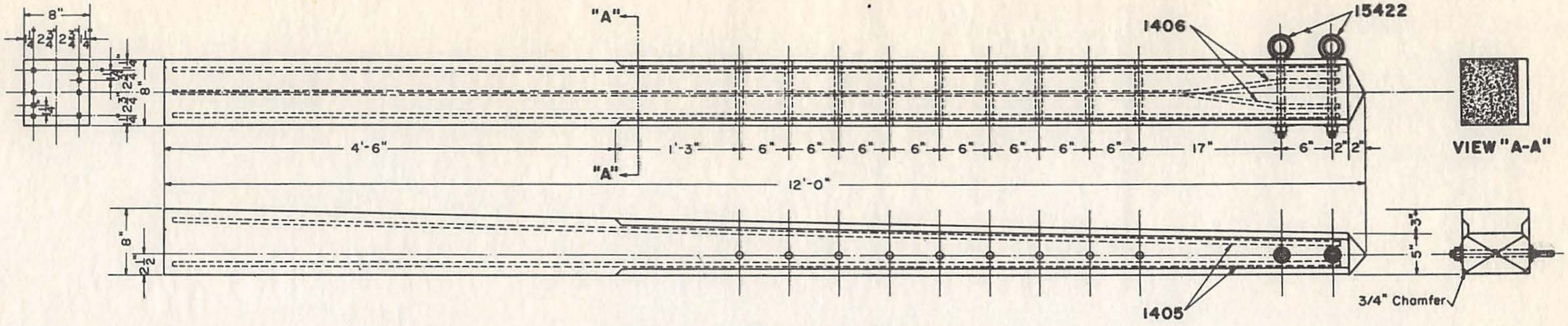
Approved: ______________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
CONCRETE CABLE POST
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 2, 1951.

Sheet No. 1

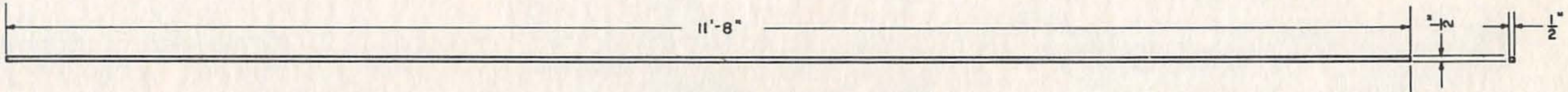
S-140

Adopted: 5-16-51.

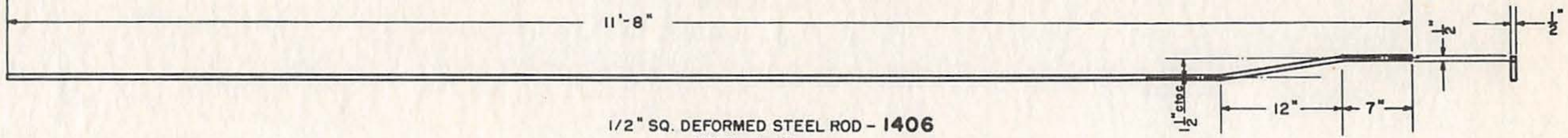


8"
1/4
2 3/4
2 3/4
1/4
8"
"A"
"A"
1406
15422
4'-6"
1'-3"
6"
6"
6"
6"
6"
6"
6"
6"
17"
6"
2"
2"
VIEW "A-A"
12'-0"
8"
2 1/2"
5"
3"
1405
3/4" Chamfer

12'-0" CONCRETE CABLE POST ASSEMBLY - **1401**



1/2" SQ. DEFORMED STEEL ROD - **1405**
(4-Required)



11'-8"
1/2"
1/2"
1 1/2" stag.
12"
7"

1/2" SQ. DEFORMED STEEL ROD - **1406**
(2-Required)

NOTES:

1-All holes cored 7/8" dia.

2-Concrete shall conform to the following,

(a) Coarse aggregate shall consist of 3/4" maximum size stone or gravel.

(b) Not less than 7 sacks of cement shall be used per cubic yard of concrete.

(c) Water content per 94 lb. sack of cement shall not exceed 6 gallons.

(d) High frequency vibrator shall be used in compacting concrete.

3-Unless otherwise specified cable post shall be furnished with only one eye bolt.

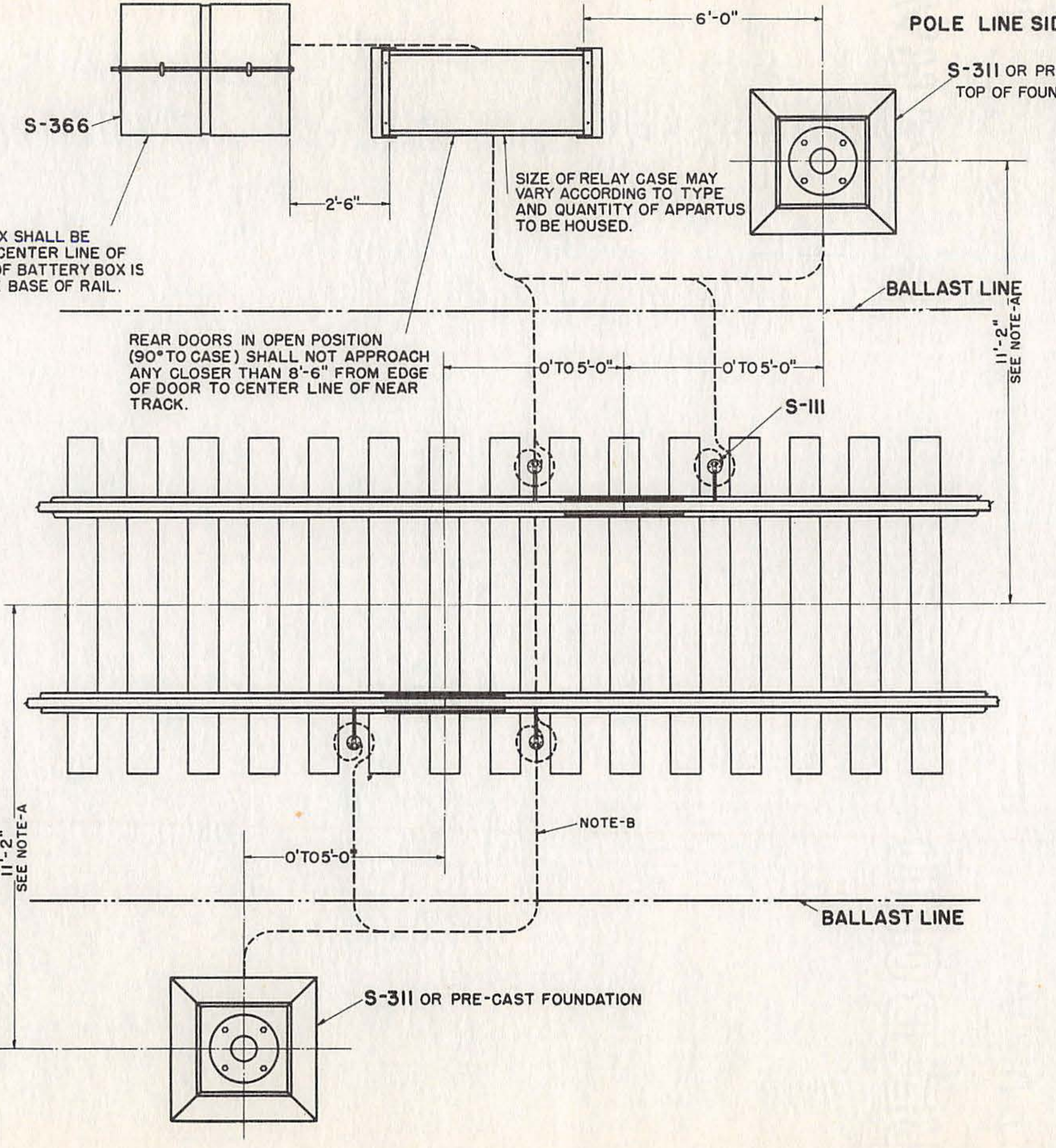
Approved: ____________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
CONCRETE CABLE POST
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 2, 1951.

Adopted: 5-16-51

Sheet No. 2

S-140



S-311 OR PRE-CAST FOUNDATION
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.

SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARTUS TO BE HOUSED.

NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.

REAR DOORS IN OPEN POSITION (90° TO CASE) SHALL NOT APPROACH ANY CLOSER THAN 8'-6" FROM EDGE OF DOOR TO CENTER LINE OF NEAR TRACK.

S-311 OR PRE-CAST FOUNDATION

NOTE A: THIS DISTANCE MAY BE MODIFIED WHERE LOCAL CONDITIONS REQUIRE, BUT SHALL NOT BE LESS THAN 9'-8."

NOTE B: UNDERGROUND CABLES UNDER TRACKS TO BE NOT LESS THAN 3'-0" BELOW BASE OF RAIL, ELSEWHERE NOT LESS THAN 2'-6". THEY SHALL BE SURROUNDED BY 6" OF LOAM, CLAY OR SAND. STONE, CINDERS OR DEBRIS MUST NOT BE PLACED DIRECTLY ON OR NEAR THE CABLES.

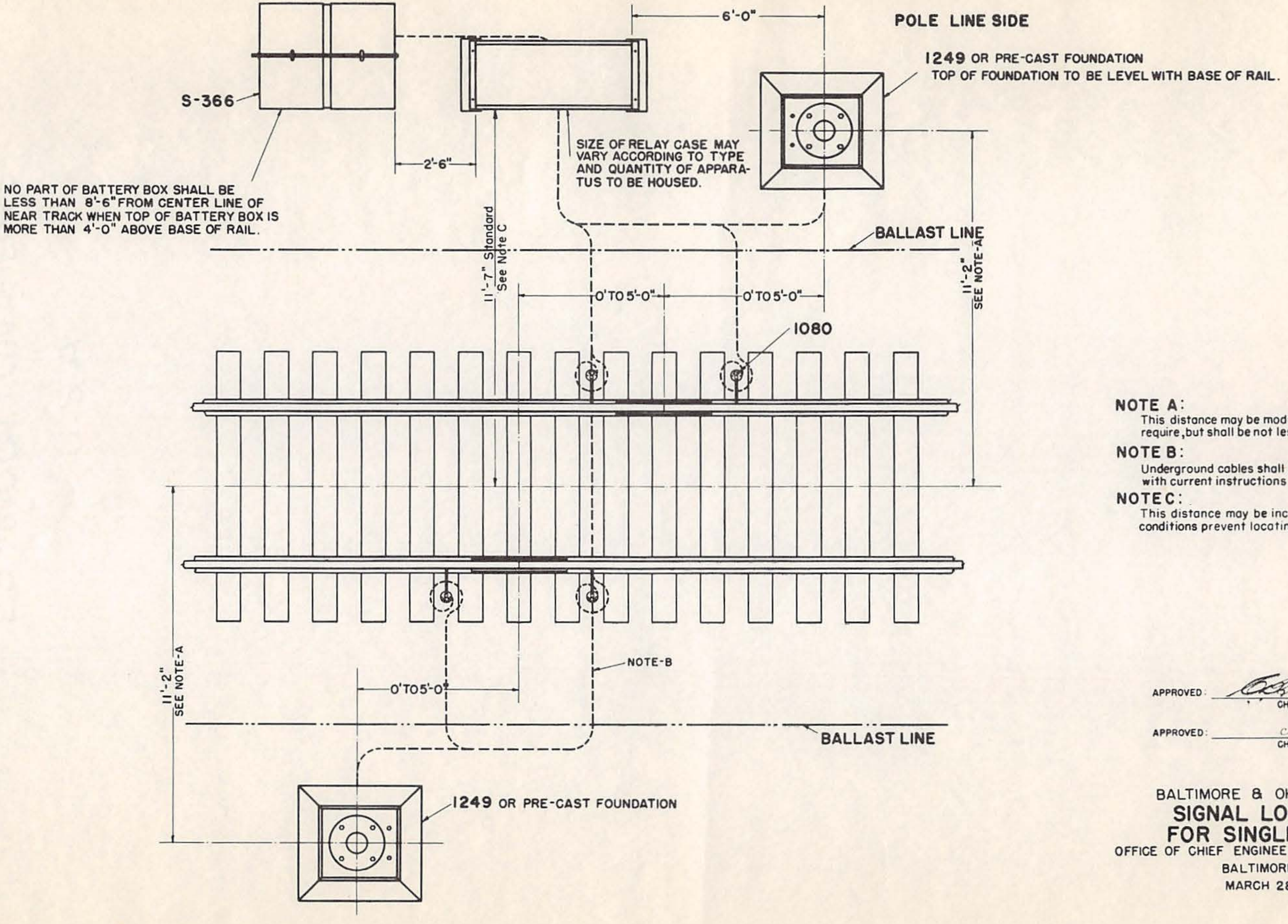
APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SIGNAL LOCATIONS FOR SINGLE TRACK
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 28, 1947

ADOPTED: 5-27-47

S-142


POLE LINE SIDE
6'-0"
1249 OR PRE-CAST FOUNDATION
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.
S-366
2'-6"
SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.
NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.
11'-7" Standard See Note C
BALLAST LINE
11'-2" SEE NOTE-A
0' TO 5'-0"
0' TO 5'-0"
1080
NOTE-B
11'-2" SEE NOTE-A
0' TO 5'-0"
BALLAST LINE
1249 OR PRE-CAST FOUNDATION

NOTE A:

This distance may be modified where local conditions require, but shall be not less than 9'-8".

NOTE B:

Underground cables shall be installed in accordance with current instructions I-131.

NOTE C:

This distance may be increased where physical conditions prevent locating relay case as shown.

APPROVED: ______ CHIEF ENG'R. MAINTENANCE

APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SIGNAL LOCATIONS FOR SINGLE TRACK
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 28, 1947

S-142-A

ADOPTED: 5-27-47
Revised: 3-30-50 account signal ons
and Note C.

ITEM NO.	DESCRIPTION	AMPS.	VOLTS	DIMENSIONS		USE	ORDERING REFERENCE
				Length	Dia. over Ferrules		
1							
2							
3	Renewable enclosed ferrule contact cartridge type	3	250	2"	9/16"	Special Applications	Buss Super-lag REN3, Graybar Electric Co.
4	" " " " " "	6	250	2"	9/16"	" "	" " REN6, " " "
5	" " " " " "	10	250	2"	9/16"	" "	" " REN10, " " "
6	" " " " " "	20	250	2"	9/16"	" "	" " REN20, " " "
7	" " " " " "	30	250	2"	9/16"	" "	" " REN30, " " "
8	" " " " " "	40	250	3"	13/16"	" "	" " REN40, " " "
9	" " " " " "	50	250	3"	13/16"	" "	" " REN50, " " "
10	" " " " " "	60	250	3"	13/16"	" "	" " REN60, " " "
11	" " " " " "	3	600	5"	13/16"	For 400-460 volt distribution panels.	" " RES3, " " "
12	" " " " " "	6	600	5"	13/16"	" " " " "	" " RES6, " " "
13	" " " " " "	10	600	5"	13/16"	" " " " "	" " RES10, " " "
14	" " " " " "	20	600	5"	13/16"	" " " " "	" " RES20, " " "
15	" " " " " "	30	600	5"	13/16"	" " " " "	" " RES30, " " "
16	Renewable enclosed knife blade cartridge type	100	250	5 7/8"		For contactor panel - Type "B" car retarders.	Economy No. F-10025 " " "
17	" " " " "	150	250	7 1/8"		For switchboard - " " " "	Shawmut No. D1026, The Case-Shawmut Co.
18	Non-renewable enclosed ferrule contact cartridge type	1.8	600	1 3/4"	9/16"	For instrument protection on distribution panels.	No. 111382 General Electric Co.
19	" " " " " "	1.3	2300	2"	9/16"	For Power Company lights-Primary circuit only. Pittsburgh Division, E.E.	No. 197563 General Electric Co.
20	" " " " " "	6	600	5"	13/16"	For insulation at relay end of single rail A.C. track circuit in D.C. propulsion territory.	Buss One-time NOS6, Graybar Electric Co.
21	" " " " " "	10	600	5"	13/16"	For insulation at transformer end of single rail A.C. track circuit in D.C. propulsion territory. S.I.R.T.	" " NOS10, " " "
22	" " " " " "	5				(Short) for signal.	Fig. 14, Plate G-0604, G.R.S.Co.
23	" " " " " "	5				(Long) for signal.	" 14a, " " "
24	" " " " " "	10				For switch, derail, or M.P.F.	" 15 " " "
25	Non-renewable glass enclosed cartridge type	3	250	1 1/2"	1/4"	Sub-station green and red indication lights. Pittsburgh Division, E.E.	General Electric Co.
26	" " " " "	1/10	250	1 1/4"	1/4"	For .03 Ampere scale of Weston model 540 Voltammeter.	Symbol AGC 1/10 Bussmann Mfg. Co.
27	" " " " "	1/4	250	1 1/4"	1/4"	" .150 " " " " " "	" AGC-1/4 " " "
28	" " " " "	2	250	1 1/4"	1/4"	" 1.5 " " " " " "	" AGC-2 " " "
29	" " " " "	4	250	1 1/4"	1/4"	" 3.0 " " " " " "	" MTH-4 " " "
30	" " " " "	20	250	1 1/4"	1/4"	" 15.0 " " " " " "	" SFE-20 " " "

BALTIMORE AND OHIO RAILROAD

FUSES USED BY SIGNAL DEPARTMENT

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 9, 1949

Sheet No. 1

S-143-A

ITEM NO.	DESCRIPTION	AMPS.	VOLTS	DIMENSIONS		USE	ORDERING REFERENCE
				Length	Dia. over Ferrules		
31	Non-renewable glass enclosed cartridge type.	30	250	1 1/4"	1/4"	For 30.0 Ampere scale of Weston model 540 Voltammeter.	Symbol AGC-30 Bussmann Mfg. Co.
32	" " " " " "	6	250	1 1/4"	1/4"	For rheostat protection of type K test set.	" MTH-6 " " "
33	Non-renewable.			5/16"	11/32"	Voltage scale of Weston models 330 and 540 meters.	No.D57073 Weston Electrical Instrument Corp'n.
34							
35	Non-renewable enclosed ferrule contact cartridge type with thermal cut-out.	.5	250			For fire protection Laughery and Otter Creek Bridges.	Buss Fusetron FRN1/2, Graybar Electric Co.
36	Non-renewable plug type.	15	125			For power service connections.	Clearsite, Graybar Electric Co.
37	" " " "	20	125			" " " "	" " " "
38	" " " "	30	125			" " " "	" " " "
39	Mica telephone type.	5				(Short) for signal.	Fig. 13, Plate G-0602, G.R.S.Co.
40	" " "	10				For switch, derail, or M.P.F.	" 14, " " "
41	Fuse links.	1				For primary fuse cutouts 400-460 volt supply lines.	Series PT1A, W.N.Matthews Corp'n.
42	" "	5				" " " " " " " " " "	" PT5A, " "
43	" "	25				For sub-station transformer bank, 2300-V side.	No. 9F1C24A General Electric Co. Fast blowing Universal cable type.
44	" "	2-5-40				For primary of 2300 volt transformers.	Joslyn expulsion type.
45	" "	2-5-40				" " " " " "	Schweitzer & Conrad for Kearney cut-out No. 5765.
46	" "	5				" " " 6600 " " Pittsburgh Division E.E.	No. 5A-100H, W.N.Matthews Corp'n.
47	" "	5				" " " 3300 " " Buffalo Division.	No. 9F1C19 General Electric Co. Fast blowing Universal cable type.
48	" "	10				For primary fuse cutout 400-460 volt supply lines.	Series PT10A, W.N.Matthews Corp'n.
49							
50	Non-renewable glass enclosed cartridge type.	1/2	250	1-1/4"	1/4"	For .3 Ampere scale of Weston model 540 Voltammeter.	Symbol AGC-1/2 Bussmann Mfg. Co.

Note:

Do not use fuse wire in field installations.

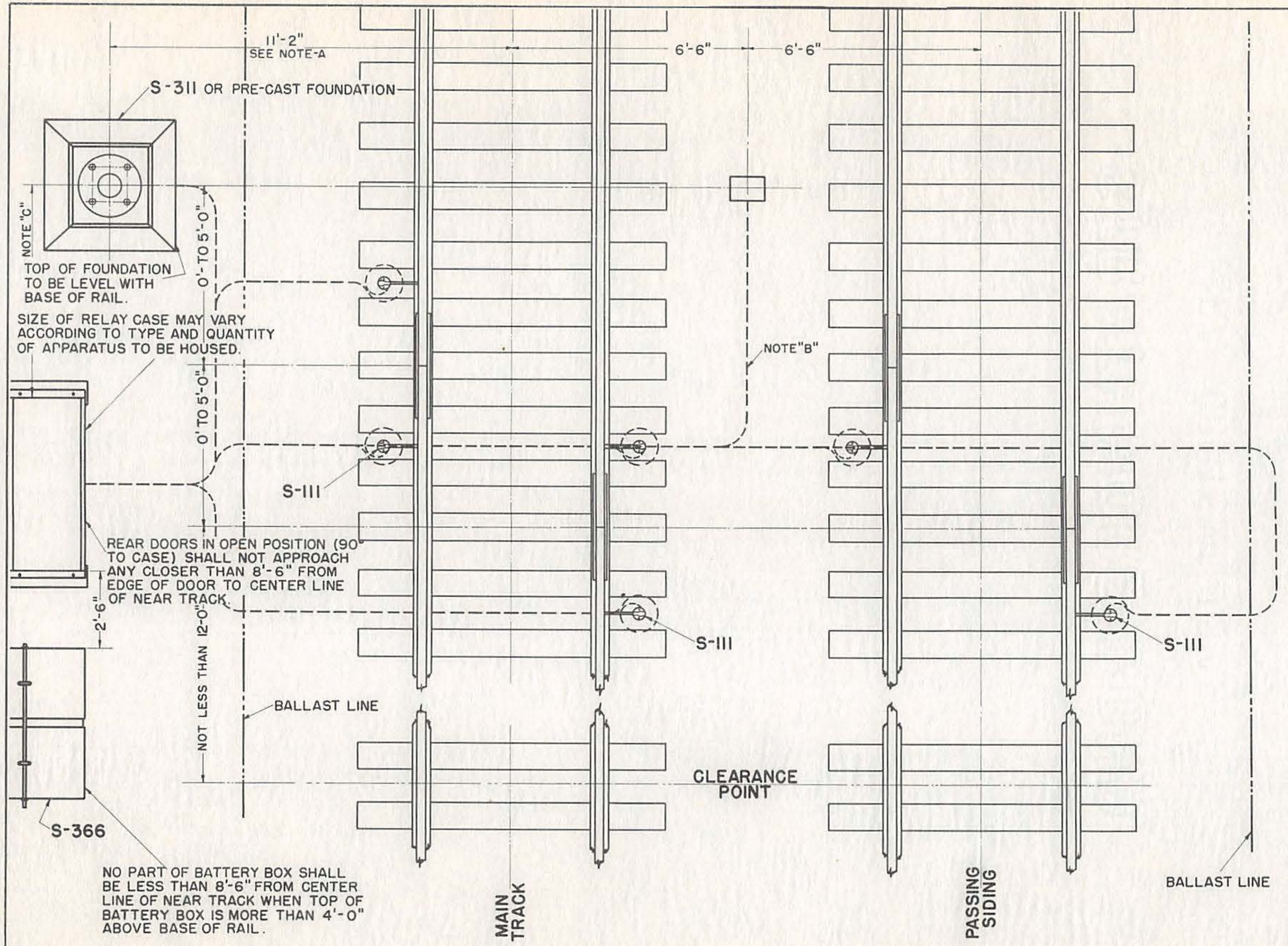
Approved: ______
Chief Eng'r. Comm. & Sigs.

Revised 12-20-51: Items 1-2-34 removed, Items 3-4-5-26 revised, Items [illegible] added.

BALTIMORE AND OHIO RAILROAD
FUSES USED BY SIGNAL DEPARTMENT
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Sept. 9, 1949

Sheet No. 2

S-143-A


11'-2"
SEE NOTE-A
6'-6"
6'-6"
S-311 OR PRE-CAST FOUNDATION
NOTE "C"
0'-TO 5'-0"
0' TO 5'-0"
NOTE "B"
S-111
S-111
S-111
2'-6"
NOT LESS THAN 12'-0"
BALLAST LINE
CLEARANCE POINT
S-366
BALLAST LINE
MAIN TRACK
PASSING SIDING

TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.

SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.

REAR DOORS IN OPEN POSITION (90° TO CASE) SHALL NOT APPROACH ANY CLOSER THAN 8'-6" FROM EDGE OF DOOR TO CENTER LINE OF NEAR TRACK.

NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.

NOTE A:

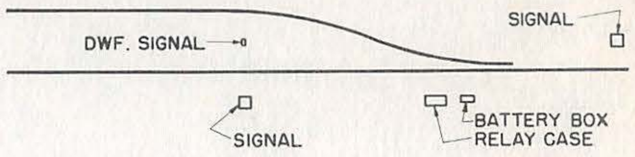
THIS DISTANCE MAY BE MODIFIED WHERE LOCAL CONDITIONS REQUIRE, BUT SHALL BE NOT LESS THAN 9'-8".

NOTE B:

UNDERGROUND CABLES UNDER TRACKS TO BE NOT LESS THAN 3'-0" BELOW BASE OF RAIL, ELSEWHERE NOT LESS THAN 2'-6". THEY SHALL BE SURROUNDED BY 6" OF LOAM, CLAY, OR SAND. STONE, CINDERS, OR DEBRIS MUST NOT BE PLACED DIRECTLY ON OR NEAR CABLES.

NOTE C:

LOCATE RELAY CASE AND BATTERY BOX MIDWAY BETWEEN ENTERING AND LEAVING SIGNAL AS SHOWN BELOW.


SIGNAL
DWF. SIGNAL
SIGNAL
BATTERY BOX
RELAY CASE

APPROVED: ______________
CHIEF ENG'R. MAINTENANCE

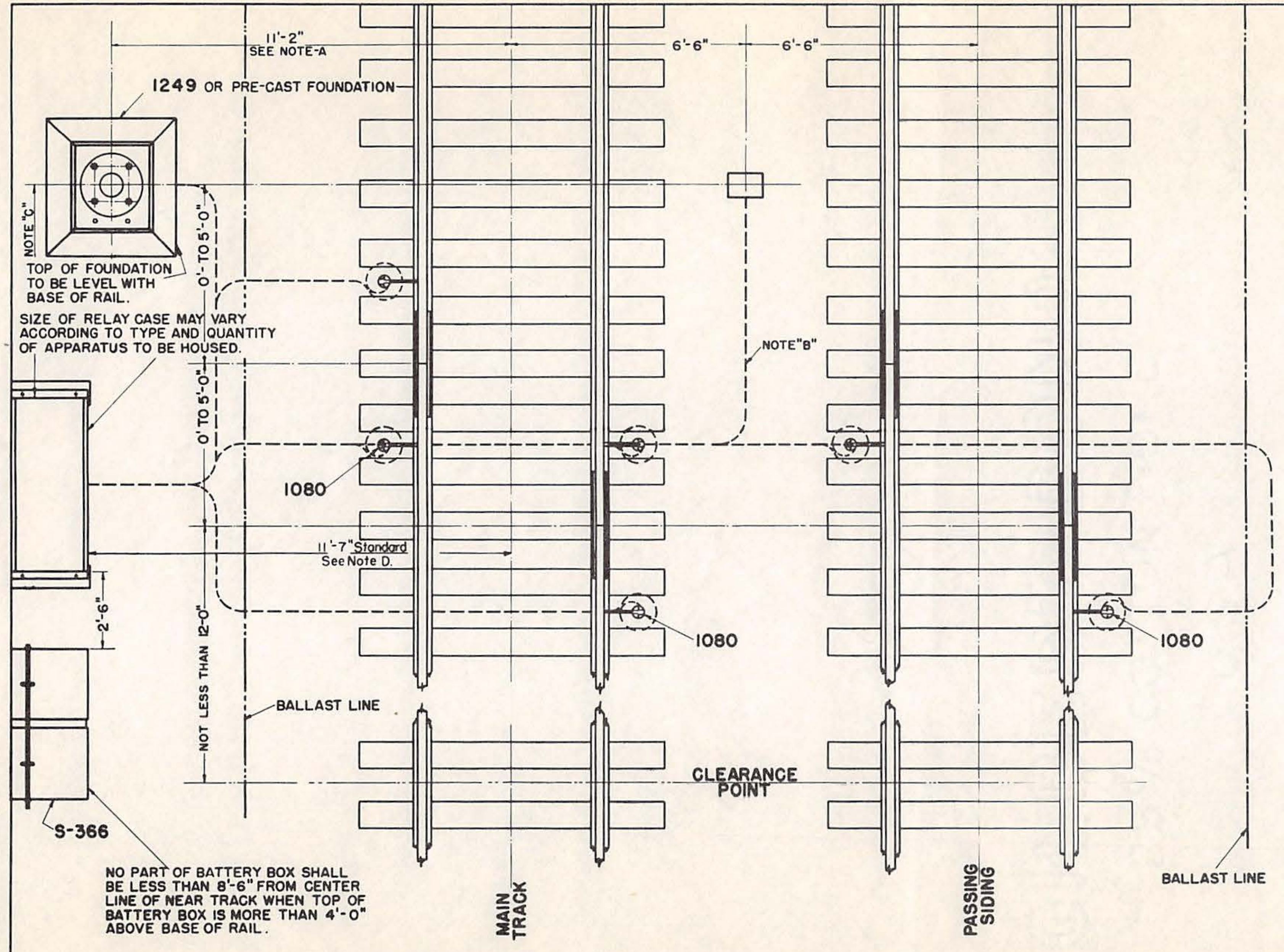
APPROVED: ______________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

SIGNAL LOCATIONS AT END OF PASSING SIDING, SINGLE TRACK

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 31, 1947

S-144

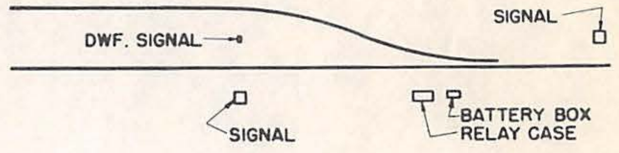

11'-2"
SEE NOTE-A
6'-6"
6'-6"
1249 OR PRE-CAST FOUNDATION
NOTE "C"
0'-TO 5'-0"
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.
SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.
NOTE "B"
0' TO 5'-0"
1080
11'-7" Standard
See Note D.
2'-6"
NOT LESS THAN 12'-0"
1080
1080
BALLAST LINE
CLEARANCE POINT
S-366
NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.
MAIN TRACK
PASSING SIDING
BALLAST LINE

NOTE A:
THIS DISTANCE MAY BE MODIFIED WHERE LOCAL CONDITIONS REQUIRE, BUT SHALL BE NOT LESS THAN 9'-8".

NOTE B:
UNDERGROUND CABLES SHALL BE INSTALLED IN ACCORDANCE WITH CURRENT INSTRUCTIONS I-131.

NOTE C:
LOCATE RELAY CASE AND BATTERY BOX MIDWAY BETWEEN ENTERING AND LEAVING SIGNAL AS SHOWN BELOW.

NOTE D:
THIS DISTANCE MAY BE INCREASED WHERE PHYSICAL CONDITIONS PREVENT LOCATING RELAY CASE AS SHOWN.


SIGNAL
DWF. SIGNAL
SIGNAL
BATTERY BOX
RELAY CASE

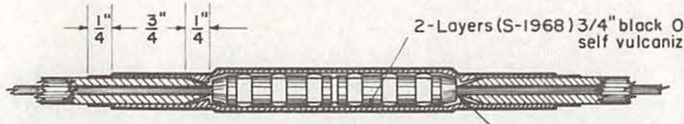
APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SIGNAL LOCATIONS AT END OF PASSING SIDING, SINGLE TRACK
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 31, 1947

S-144-A

Revised 3-30-50 account signal ion
and Note D.

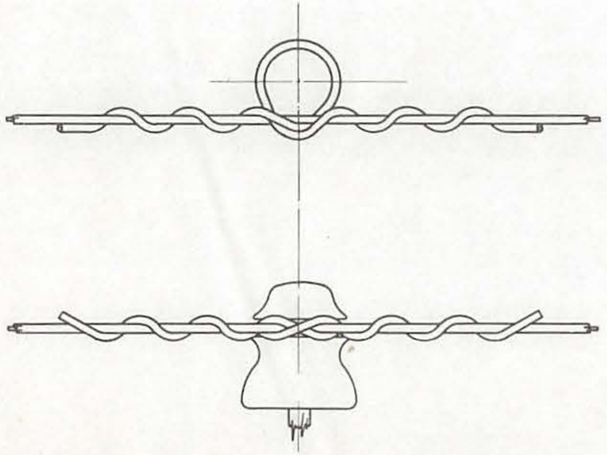


2-Layers (S-1968) 3/4" black Okoweld four purpose self vulcanizing tape.

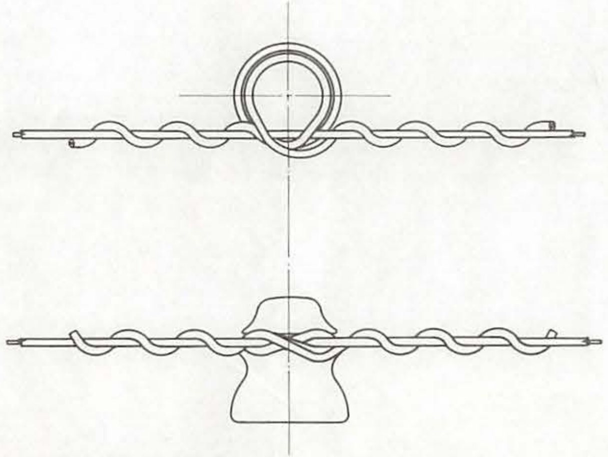
For preparation of conductors before splicing see current Instructions I-130, Paragraph 9-B-1.

COMPRESSION SLEEVE SPLICE - **1465**

Price List No.		
S-605 -	No. 1-102x064C	Reducing Sleeve for 1-No.10 A.W.G. & 1-No.14 A.W.G. solid copper wire.
S-608 -	No. 1-204M	Splicing Sleeve for No.4 A.W.G. solid copper wire
S-609 -	No. 1-162J	Splicing Sleeve for No.6 A.W.G. solid copper wire
S-613 -	No. 3-064B	Splicing Sleeve for No.14 A.W.G. solid copper wire
S-610 -	No. 1-128M	Splicing Sleeve for No.8 A.W.G. solid Copperweld wire.
S-611 -	No. 1-102J	Splicing Sleeve for No.10 A.W.G. solid Copperweld wire.



METHOD OF TYING WIRES ON INSULATORS - **1462**



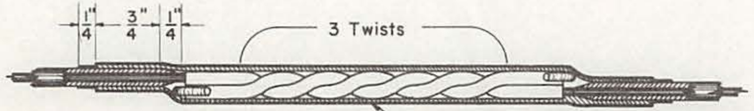
METHOD OF TYING WIRES ON INSULATORS - **1463**

Notes:

1 - See current instructions I-130 for the application of ties and splices shown on this drawing.

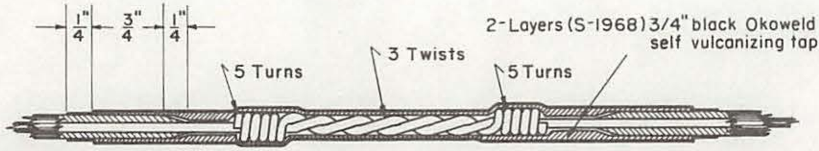
2 - Where practicable, Iron line wire will not be spliced to Copper or Copperweld line wire except at normal dead ending locations. If a splice is required between such locations use splice No.1464 24" from any crossarm.

3 - Wire for use under tension must not be heated or soldered.



2-Layers (S-1968) 3/4" black Okoweld four purpose self vulcanizing tape.

DOUBLE TUBE TWIST TYPE SLEEVE SPLICE - **1464**



2-Layers (S-1968) 3/4" black Okoweld four purpose self vulcanizing tape.

TWISTED AND SOLDERED SPLICE - **1466**

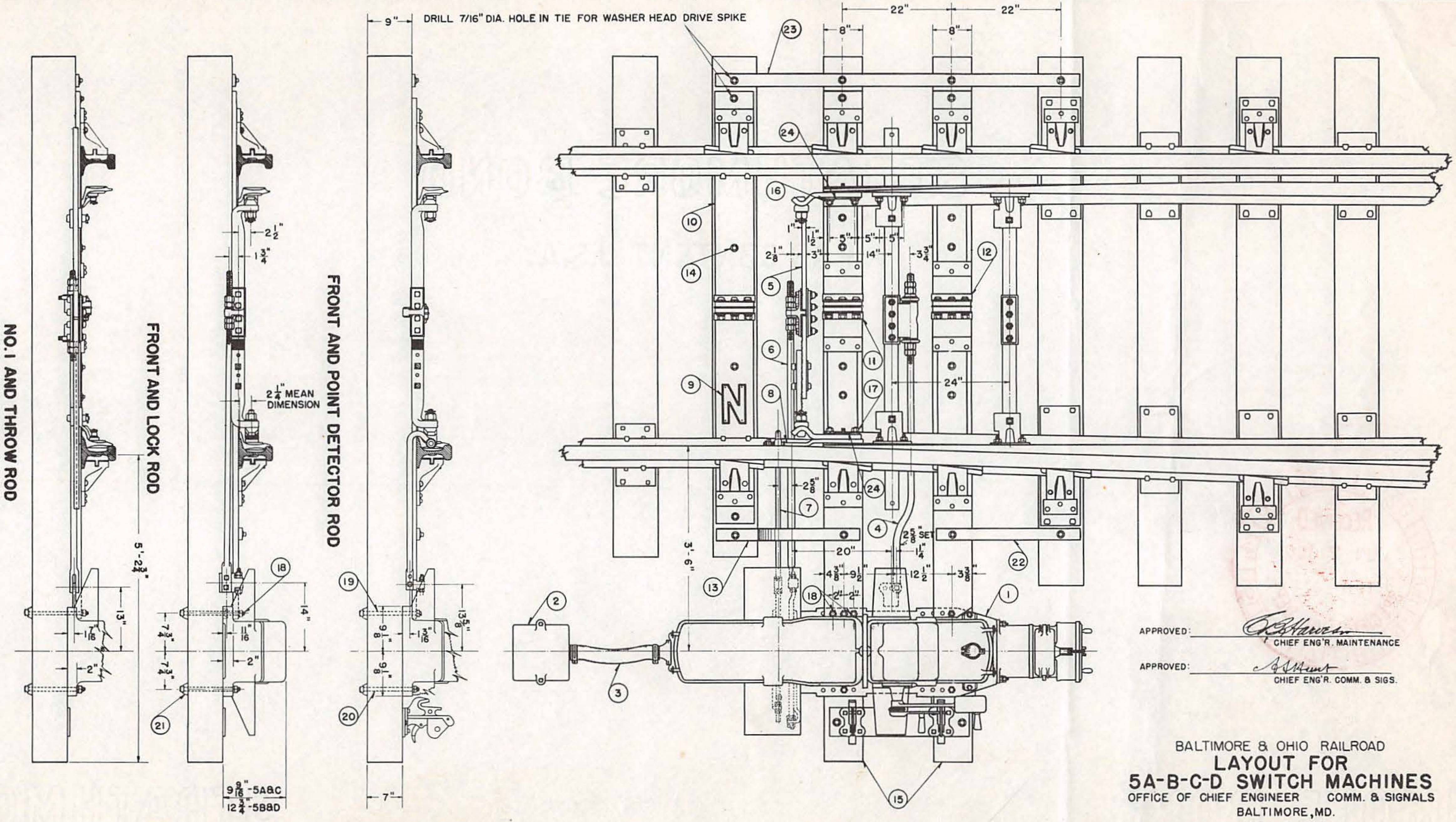
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LINE WIRE SPLICES AND TIES
Office of Signal Engineer
Baltimore, Md.
June 17, 1959.

Adopted: 3-30-49.
2-18-57: Note 3 added and Twisted an[illegible]ered Splice changed to No.1466.
1-17-59: Okoweld tape added & 1465 revised.

Sheet No.1

S-146-B


DRILL 7/16" DIA. HOLE IN TIE FOR WASHER HEAD DRIVE SPIKE
9"
7"
22"
22"
8"
8"
NO.1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
2½"
1¾"
2¼" MEAN DIMENSION
5'-2¾"
13"
1 1/16"
2"
7¾"
7¾"
14"
11/16"
2"
9 9/16"-5A&C
12¾"-5B&D
13⅝"
9⅛"
9⅛"
1 3/16"
1"
1½"
5"
5"
5"
14"
3¾"
2⅛"
3"
24"
2⅝"
3'-6"
20"
2⅝" SET
1¼"
4⅜"
9½"
12½"
3⅜"
2"
2"
N
1
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APPROVED: ______ CHIEF ENG'R. MAINTENANCE

APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

LAYOUT FOR
5A-B-C-D SWITCH MACHINES

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 19, 1947

SHEET NO. 1

S-147

RECEIVED
JUN 7 1963
SPECIFICATION DEPT.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 5A-B-C-D SWITCH MACHINES

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	SWITCH MACHINE (SEE NOTE)	
2		1	16-WAY JUNCTION BOX WITH 3" PIPE PEDESTAL 2'-6" LONG.	52918-11GRS
3		1	$1\frac{1}{2}$" I.D. DIA. X 18" LONG RUBBER HOSE COMPLETE WITH CLAMPS	
4	1537	1	OPERATING ROD ASSEMBLY	S-153
5	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163
6	1538	1	LOCK ROD ASSEMBLY	S-153
7	1534	1	POINT DETECTOR ROD	S-153
8	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153
9		1	LETTER "N"	31760-62
10		1	NO. 1 INSULATED GAUGE PLATE TO CONSIST OF 2-"A" PLATES	36070+
11		1	NO. 2 " " " " " " 1-"B" & 1-"D" PLATE	36070+
12		1	NO. 3 " " " " " " " " " "	36070+
13	1531-5	1	$2\frac{1}{2}$" X $\frac{1}{2}$" X 2'-$5\frac{1}{2}$" LONG TIE STRAP	S-153
14		24	WASHER HEAD DRIVE SPIKES	
15	1520	2	8" X 9" X 12'-0" SAWED OAK SWITCH TIES	S-152
16	1540	2	$\frac{3}{4}$" DIA. X $4\frac{1}{4}$" LONG FRONT FOOT BOLT ASSEMBLY	S-154
17	1541	2	$\frac{3}{4}$" DIA. X 5" " " " " "	S-154
18		2	$\frac{3}{4}$" DIA. X $3\frac{1}{4}$" LONG SQ. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS	
19		2	$\frac{3}{4}$" DIA. X $12\frac{1}{2}$" " " " " " " " " "	
20		2	$\frac{3}{4}$" DIA. X $11\frac{1}{2}$" " " " " " " " " "	
21	C12398	4	CAST-IRON WASHERS	S-76140-A
22	1531-4	1	$2\frac{1}{2}$" X $\frac{1}{2}$" X 2'-$5\frac{1}{2}$" LONG TIE STRAP	S-153
23	1531-3	1	$2\frac{1}{2}$" X $\frac{1}{2}$" X 6'-2" " " "	S-153
24	125512	2	SWITCH LUG PLATES	S-364

NOTE:

FOR SWITCH MACHINES SEE G.R.S.CO. CATALOGUE SECTION J, PART 31 AND SPECIFY MODEL 5A-B-C OR D, WIRING DIAGRAM, AND WHETHER FOR RIGHT OR LEFT HAND TURNOUT.

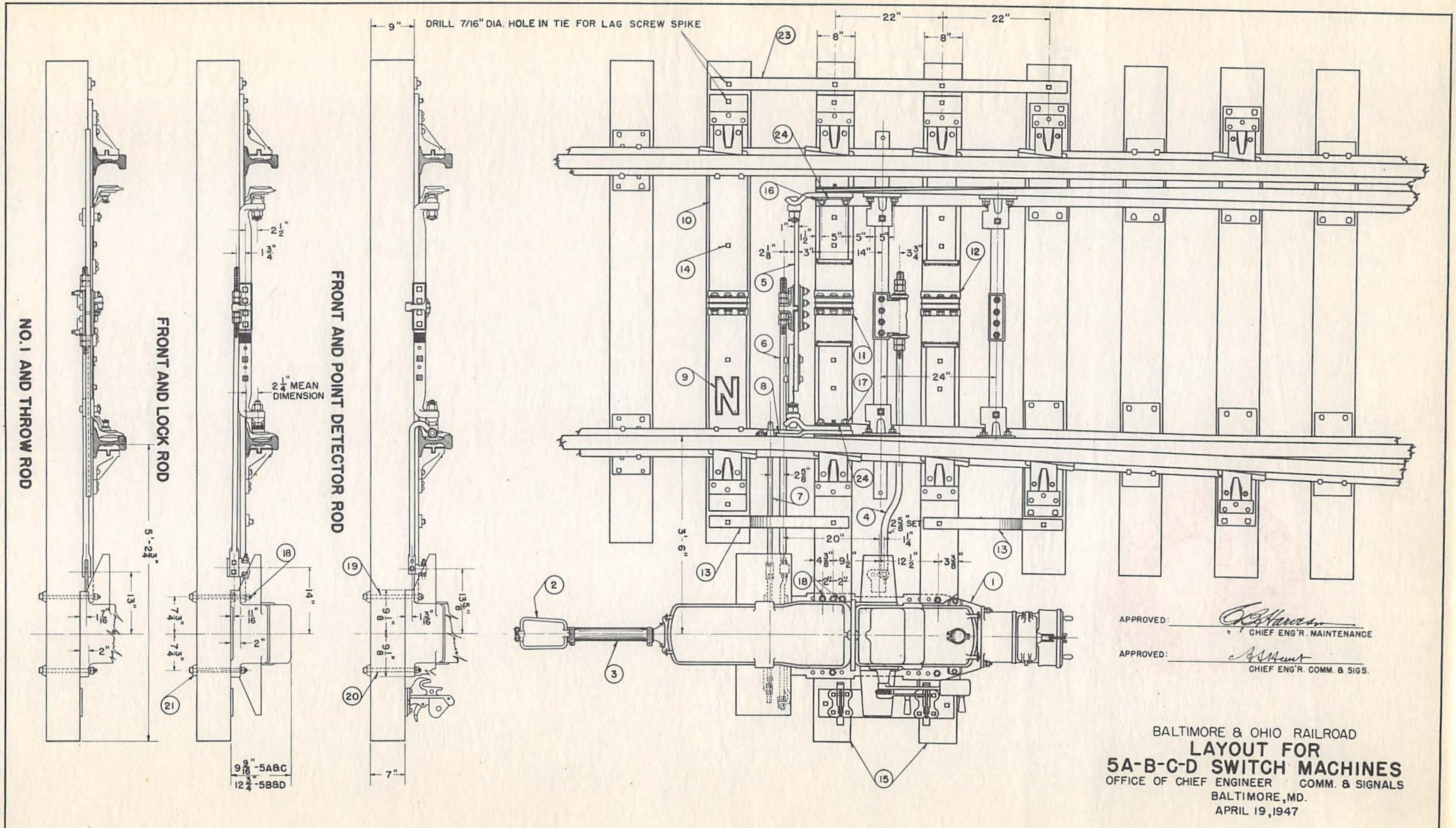
WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT & SECTION OF RAIL. CHIEF ENGINEER MAINTENANCE DRAWING NO. 36070+.

APPROVED: ______________
CHIEF ENG'R. MAINTENANCE

APPROVED: ______________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR
5A-B-C-D SWITCH MACHINES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 19, 1947

SHEET NO. 2 S-147


9"
DRILL 7/16" DIA. HOLE IN TIE FOR LAG SCREW SPIKE
22"
22"
8"
8"
23
24
16
10
14
5
6
9
8
N
11
12
17
1"
1 1/2"
2 1/8"
3"
5"
5"
5"
14"
3 3/4"
24"
2 5/8"
7
24
4
2 5/8" SET
1 1/4"
20"
4 3/8"
9 1/2"
12 1/2"
3 3/8"
2"
2"
18
13
13
3'-6"
1
2
3
15
2 1/2"
1 3/4"
2 1/4" MEAN DIMENSION
NO.1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
5'-2 3/4"
13"
1 7/16"
2"
14"
7 3/4"
7 3/4"
1 1/16"
2"
9 9/16"-5A&C
12 3/4"-5B&D
13 5/8"
9 1/8"
9 1/8"
1 3/16"
7"
18
19
20
21

APPROVED: C.B. Hawes
CHIEF ENG'R. MAINTENANCE

APPROVED: A.S. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

LAYOUT FOR
5A-B-C-D SWITCH MACHINES

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 19, 1947

Adopted: 12-9-47.
Revised 1-13-50 account chan
Gauge Plate Assembly & Lag S
Spikes.
Revised 8-29-50 account Item 3 revised.
Revised 12-14-51: Item 22 changed to 13.

SHEET NO. 1

S-147-C

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 5A-B-C-D SWITCH MACHINES				
ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	SWITCH MACHINE (SEE NOTE)	
2		1	16-WAY JUNCTION BOX, RACO NO. 583-1	
3	15311	1	$1\frac{7}{8}$" I.D. DIA. X 18" LONG RUBBER HOSE COMPLETE WITH CLAMPS	S-153 -SH.2
4	1843	1	OPERATING ROD ASSEMBLY	S-184 -SH.1
5	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163
6	1834	1	LOCK ROD CONNECTING ROD	S-183 -SH.1
7	1822	1	POINT DETECTOR ROD	S-182 -SH.1
8	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153 -SH.1
9		1	LETTER "N"	31760-62
10		1	NO. 1 INSULATED GAUGE PLATE ASSEMBLY	37019
11		1	NO. 2 " " " "	37019
12		1	NO. 3 " " " "	37019
13	1531-5	2	$2\frac{1}{2}$" X $\frac{1}{2}$" X 2'-$5\frac{1}{2}$" LONG TIE STRAP	S-153 -SH.1
14	13811	24	GALVANIZED LAG SCREW SPIKE	S-382
15	1520	2	8" X 9" X 12'-0" SAWED OAK SWITCH TIES	S-152
16	1540	2	$\frac{3}{4}$" DIA. X $4\frac{1}{4}$" LONG FRONT FOOT BOLT ASSEMBLY	S-154
17	1541	2	$\frac{3}{4}$" DIA. X 5" " " " " "	S-154
18		2	$\frac{3}{4}$" DIA. X $3\frac{1}{4}$" LONG SQ. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS	
19		2	$\frac{3}{4}$" DIA. X $12\frac{1}{2}$" " " " " " " " " "	
20		2	$\frac{3}{4}$" DIA. X $11\frac{1}{2}$" " " " " " " " " "	
21	C12398	4	CAST-IRON WASHERS	S-76140-A
22				
23	1531-3	1	$2\frac{1}{2}$" X $\frac{1}{2}$" X 6'-2" " " "	S-153 -SH.1
24	125512	2	SWITCH LUG PLATES	S-364

NOTE:

FOR SWITCH MACHINES SEE G.R.S.CO. CATALOGUE SECTION J, PART 31 AND SPECIFY MODEL 5A-B-C OR D, WIRING DIAGRAM, AND WHETHER FOR RIGHT OR LEFT HAND TURNOUT.

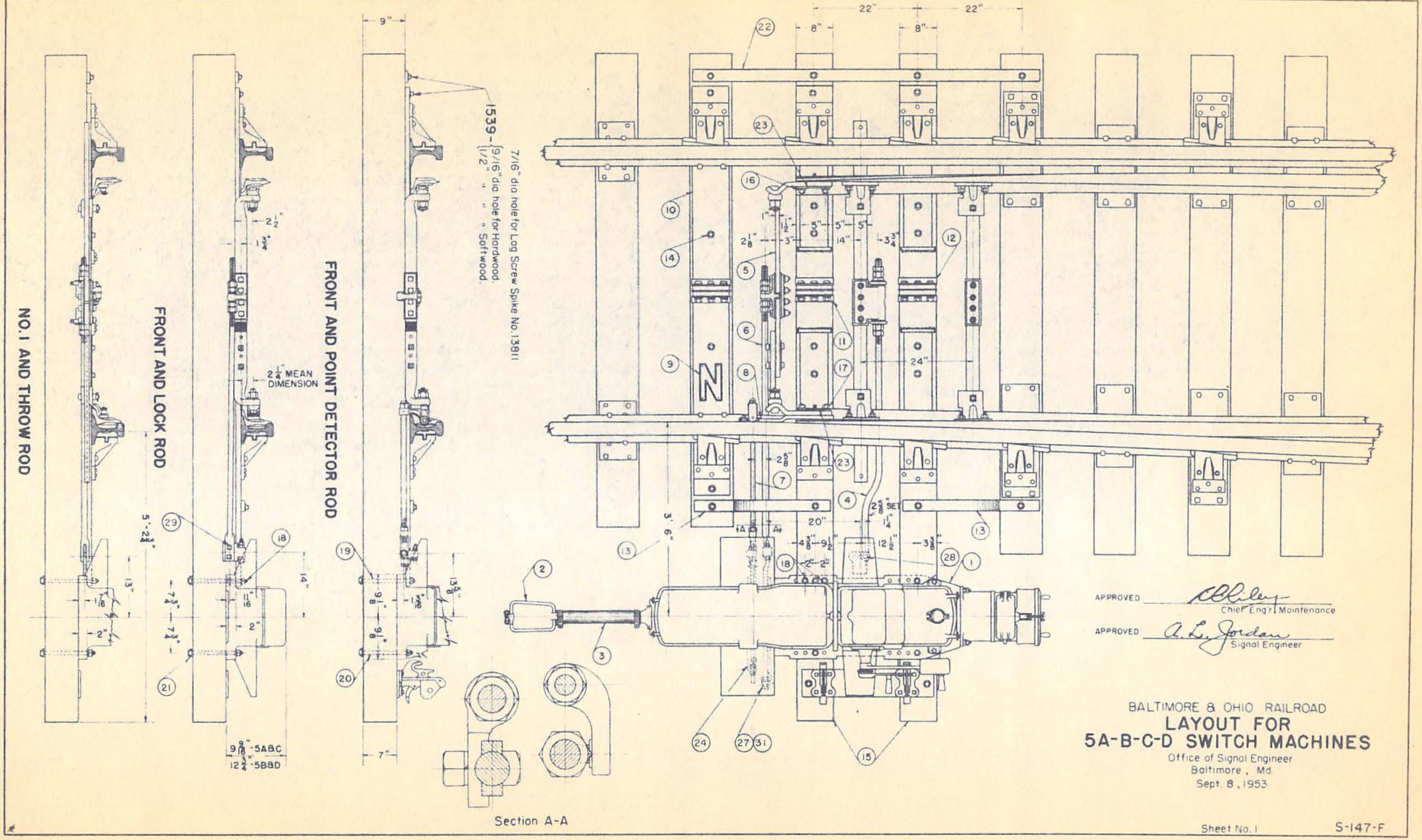
WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT & SECTION OF RAIL. CHIEF ENGINEER MAINTENANCE DRAWING NO. 37019.

APPROVED: C. B. Harvey
CHIEF ENG'R. MAINTENANCE

APPROVED: A. S. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR
5A-B-C-D SWITCH MACHINES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 19, 1947

SHEET NO. 2 S-147-C


NO.1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
7/16" dia. hole for Lag Screw Spike No. 13811
1539 – 9/16" dia hole for Hardwood
1/2" " " Softwood
2¼" MEAN DIMENSION
9 9/16"-5ABC
12 3/4"-5BBD
5'-2 3/4"
Section A-A
22"
8"
9"
7"
20"
24"
14"
3'-6"
2 5/8" SET
N
A
(1)
(2)
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(4)
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(31)

APPROVED A. L. Jordan
Chief Eng'r. Maintenance

APPROVED A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR
5A-B-C-D SWITCH MACHINES

Office of Signal Engineer
Baltimore, Md.
Sept. 8, 1953

Sheet No. 1

S-147-F

Adopted 12-9-47
Revised 1-13-50 account changes in Gauge Plate Assembly & Log Screw Spikes

Revised 8-29-50 account item 3 revised

Revised 12-14-51 Item 22 changed to 13.

Revised 3-26-54 Lag Screw 13811 changed to Drive Spike 1539

Revised 5-17-55 account Items 7, 21 & 25 changed.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 5A-B-C-D SWITCH MACHINES

ITEM	NUMBER	REQ'D	NAME	DRAWING
1		1	Switch Machine (See note).	
2	2291	1	16-way Junction Box.	S-229-A,sh.1
3	15311	1	1-7/8"I.D. x 18"long Rubber Hose Complete with clamps.	S-153-F,sh.2
4	1843	1	Operating Rod Assembly.	S-184-B,sh.1
5	1630	1	Swivel Front Rod Assembly.	S-163-B
6	1834	1	Lock Rod Connecting Rod.	S-183-C,sh.1
7	1822	1	Point Detector Connecting Rod Assembly	S-182-B,sh.1
8	1532	1	Switch Circuit Controller Lug Assembly.	S-153-F,sh.1
9		1	Letter "N".	31760-62
10		1	No. 1 Insulated Gauge Plate Assembly.	37019
11		1	No. 2 " " " "	37019
12		1	No. 3 " " " "	37019
13	1531-5	2	2-1/2"x1/2"x2'-5-1/2" long Tie Strap.	S-153-F,sh.1
14	1539	24	Galvanized Drive Spike.	S-153-F,sh.2
15	1520	2	8"x 9"x 12'-0" Sawed Oak Switch Ties.	S-152-A,sh.1
16	1540	2	3/4"Dia. x 4-1/4"long Front Foot Bolt Assembly.	S-154-D,sh.1
17	1541	2	3/4"Dia. x 5" " " " " "	S-154-D,sh.1
18		2	3/4"Dia. x 3-1/4"long Sq. Hd. Hex. Nut Machine Bolt with Spring Washer.	
19		2	3/4"Dia. x 12-1/2" " " " " " " " " " "	
20		2	3/4"Dia. x 11-1/2" " " " " " " " " " "	
21	15320	4	Roco Bolt Grip for 3/4"dia. Bolt. (Roco No. 589-1)	S-153-F, sh.3
22	1531-3	1	2-1/2"x 1/2"x 6'-2"long Tie Strap.	S-153-F,sh.1
23	125512	2	Switch Lug Plate.	S-364
24	18220	1	Point Detector Rod Assembly.	S-182-B,sh.6
25				
26				
*27	18325	1	Adjustable Lock Rod Assembly (for Right Hand Movement).	S-183-C,sh.3
28	15426	1	Turned Bolt Assembly.	S-154-D,sh.1
29		2	3/4"-10 x 2-1/2" lg.Sq.Hd.Machine Bolt with ESNA No.49U-120 Hex.Nut & Spring Washer.	
30				
*31	18324	1	Adjustable Lock Rod Assembly (for Left Hand Movement).	S-183-C,sh.3

Note:

For Switch Machines see G.R.S.Co.Catalogue Section J, Part 31 and specify Model 5A-B-C or D, Wiring Diagram, and whether for Right or Left Hand Turnout.

When ordering Insulated Gauge Plates specify weight & section of rail. Chief Engineer Maintenance Drawing No.37019.

*-For Left Hand Movement omitt Item 27 and use Item 31.

Approved:
Chief Eng'r. Maintenance

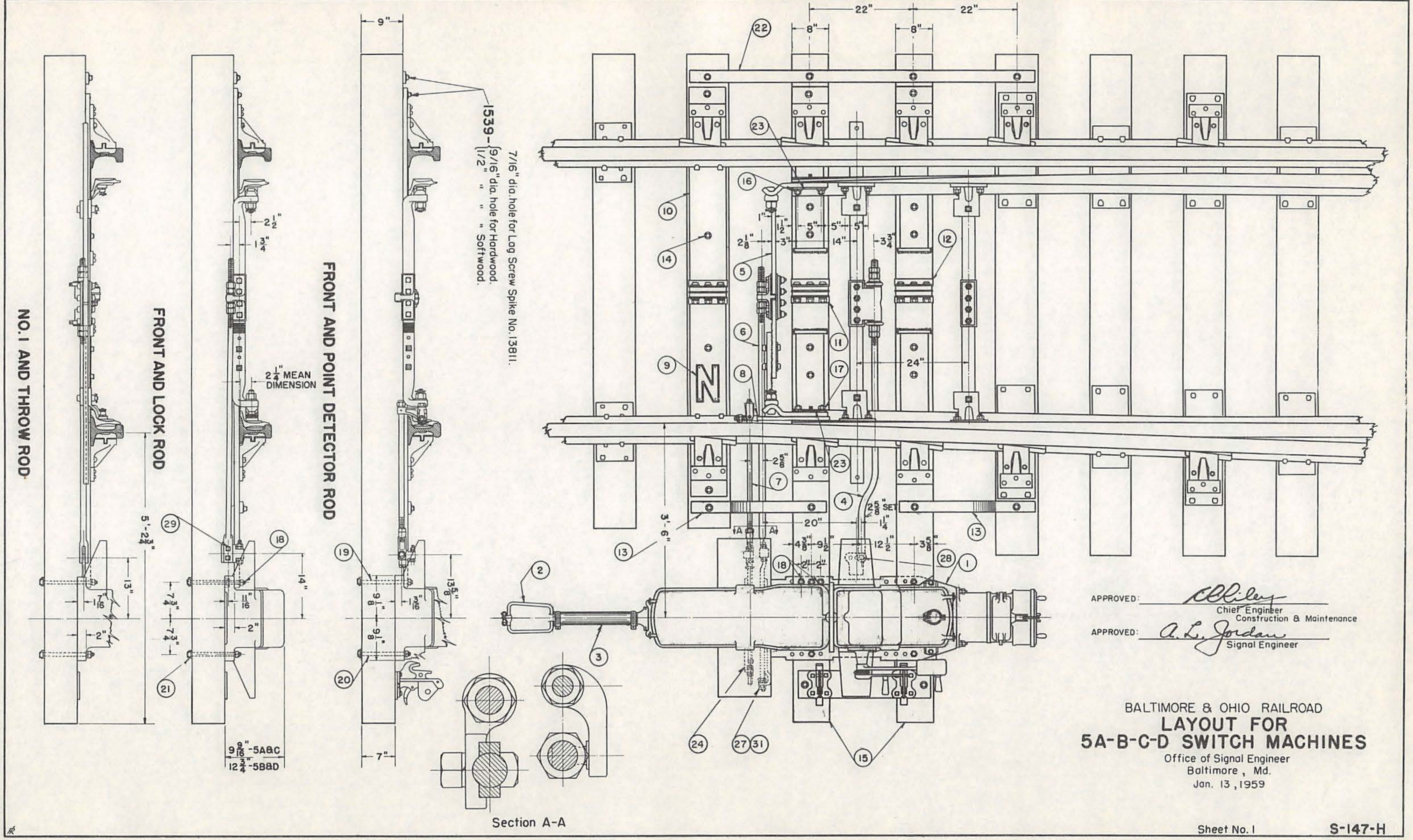
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR
5A-B-C-D SWITCH MACHINES
Office of Signal Engineer
Baltimore, Md
Sept. 8, 1953

9-8-53 -New plan made
Revised 5-17-55 account Items changed.

Sheet No.2 S-147-F

Made & Corrected: 4-19-47.
Adopted: 12-9-47.
Revised: 1-30-50 account changes in Gauge Plate Assembly & Lag Screw Spikes.
Revised: 8-29-50 account Item 3 revised.
Revised: 12-14-51 Item 22 changed to 13
Revised: 3-26-54 Lag Screw 13811 changed to Drive Spike 1539.
Revised 5-17-55 account Items 7,21 & 25 changed.
Revised: 1-13-59 Item 8 changed & 3-3/8" locating dim. changed to 3-5/8", 1532 & 1532-1 rev.


NO. 1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
7/16" dia. hole for Lag Screw Spike No. 13811.
1539 - (9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
2 1/4" MEAN DIMENSION
5'-2 3/4"
9 9/16"-5A&C
12 3/4"-5B&D
Section A-A
3'-6"
22"
8"
24"
20"
14"
13"
13 5/8"
2 5/8" SET
N
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
27
28
29
31

APPROVED: C. Riley
Chief Engineer
Construction & Maintenance

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR
5A-B-C-D SWITCH MACHINES

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 1

S-147-H

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 5A-B-C-D SWITCH MACHINES

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See note).	
2	2291	1	16-way Junction Box.	S-229-A,sh.1
3	15311	1	1-7/8"I.D.x18"long Rubber Hose Complete with clamps.	S-153-H,sh.2
4	1843	1	Operating Rod Assembly.	S-184-D,sh.1
5	1630	1	Swivel Front Rod Assembly.	S-163-C
6	1834	1	Lock Rod Connecting Rod.	S-183-D,sh.1
7	1822	1	Point Detector Connecting Rod Assembly	S-182-B,sh.1
8	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H,sh.1
9		1	Letter "N".	31760-62
10		1	No. 1 Insulated Gauge Plate Assembly. (Shown on Pg.206 Roadway & Track Standard Book)	37019
11		1	No. 2 " " " " " " " " " " " " "	37019
12		1	No. 3 " " " " " " " " " " " " "	37019
13	1531-5	2	2-1/2"x1/2"x2'-5-1/2" long Tie Strap.	S-153-H,sh.1
14	1539	24	Galvanized Drive Spike.	S-153-H,sh.2
15	1520	2	8"x 9"x 12'-0" Sawed Oak Switch Ties.	S-152-B,sh.1
16	1540	2	3/4"Dia.x 4-1/4"long Front Foot Bolt Assembly.	S-154-F,sh.1
17	1541	2	3/4"Dia.x 5" " " " " "	S-154-F,sh.1
18		2	3/4"Dia.x 3-1/4"long Sq. Hd. Hex. Nut Machine Bolt with Spring Washer.	
19		2	3/4"Dia.x 12-1/2" " " " " " " " " " "	
20		2	3/4"Dia.x 11-1/2" " " " " " " " " " "	
21	15320	4	Raco Bolt Grip for 3/4"dia. Bolt. (Raco No. 589-1).	S-153-H, sh.3
22	1531-3	1	2-1/2"x 1/2"x 6'-2"long Tie Strap.	S-153-H,sh.1
23	125512	2	Switch Lug Plate.	S-364
24	18220	1	Point Detector Rod Assembly.	S-182-B,sh.6
25				
26				
✻27	18325	1	Adjustable Lock Rod Assembly (for Right Hand Movement).	S-183-D,sh.3
28	15426	1	Turned Bolt Assembly.	S-154-F,sh.1
29		2	3/4"-10 x 2-1/2" lg.Sq.Hd.Machine Bolt with ESNA No.49U-120 Hex.Nut & Spring Washer.	
30				
✻31	18324	1	Adjustable Lock Rod Assembly (for Left Hand Movement.).	S-183-D,sh.3

Note:

For Switch Machines see G.R.S.Co. Catalogue Section J, Part 31 and specify Model 5A-B-C or D, Wiring Diagram, and whether for Right or Left Hand Turnout.

When ordering Insulated Gauge Plates specify weight & section of rail. Chief Engineer Construction & Maintenance Drawing No. 37019.

✻-For Left Hand Movement omitt Item 27 and use Item 31.

Approved: C.B. Riley
Chief Engineer
Construction & Maintenance

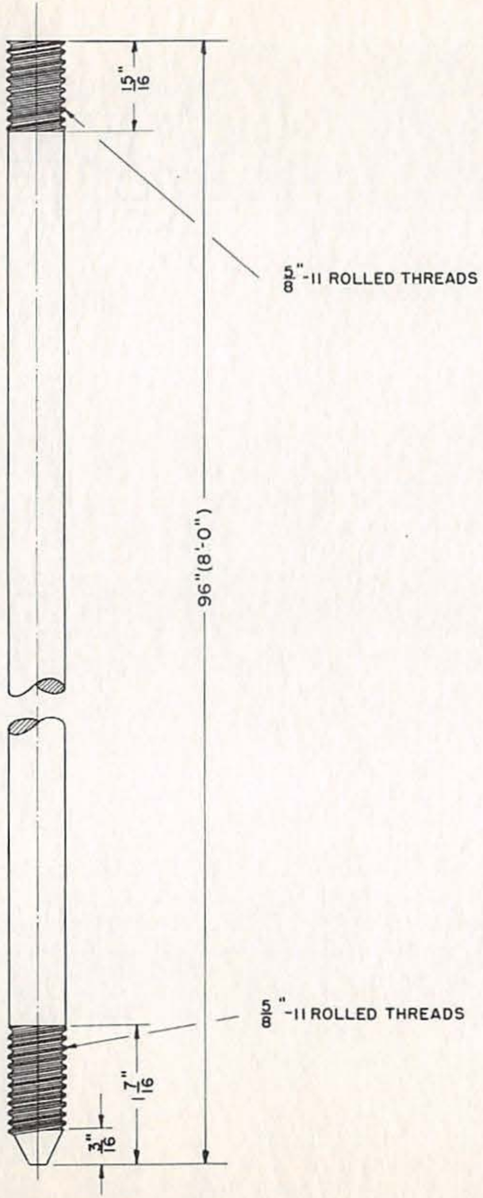
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR
5A-B-C-D SWITCH MACHINES
Office of Signal Engineer
Baltimore, Md
Jan. 13, 1959

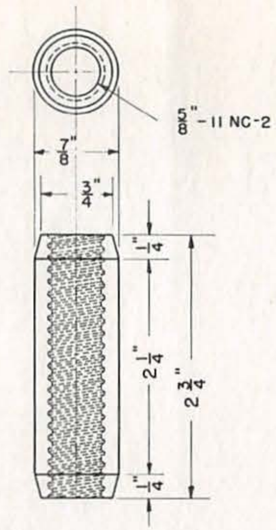
9-8-53: New plan made.
5-17-55: Revised account Items 7, 21 & 25 changed.
3-5-57: Revised.
1-13-59: 1532 & 1532-1 revised.

Sheet No. 2 S-147-H

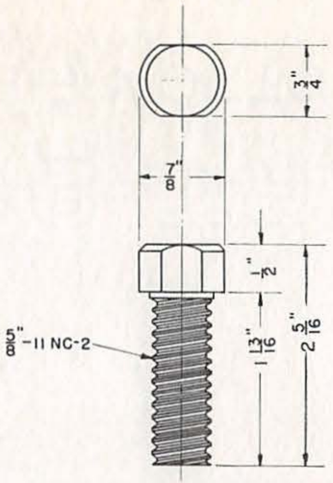
ADOPTED: 3-30-49.


15/16"
5/8"-11 ROLLED THREADS
96"(8'-0")
5/8"-11 ROLLED THREADS
1 7/16"
3/16"

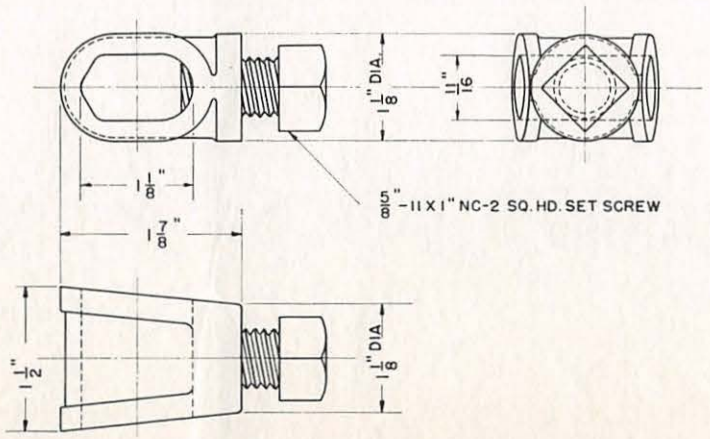
5/8" SECTIONAL GROUND ROD - 1481
(COPPERWELD CO. NO. 29438 OR EQUIVALENT)


5/8"-11 NC-2
7/8"
3/4"
1/4"
2 1/4"
2 3/4"
1/4"

BRONZE COUPLING - 1482
(COPPERWELD CO. NO. 9534 OR EQUIVALENT)


3/4"
7/8"
1/2"
5/8"-11 NC-2
1 13/16"
2 5/16"

STEEL DRIVING STUD - 1483
(HUBBARD & CO. NO. 29534 OR EQUIVALENT)


1 1/8" DIA.
11/16"
1 1/8"
5/8"-11 X 1" NC-2 SQ. HD. SET SCREW
1 7/8"
1 1/2"
1 1/8" DIA.

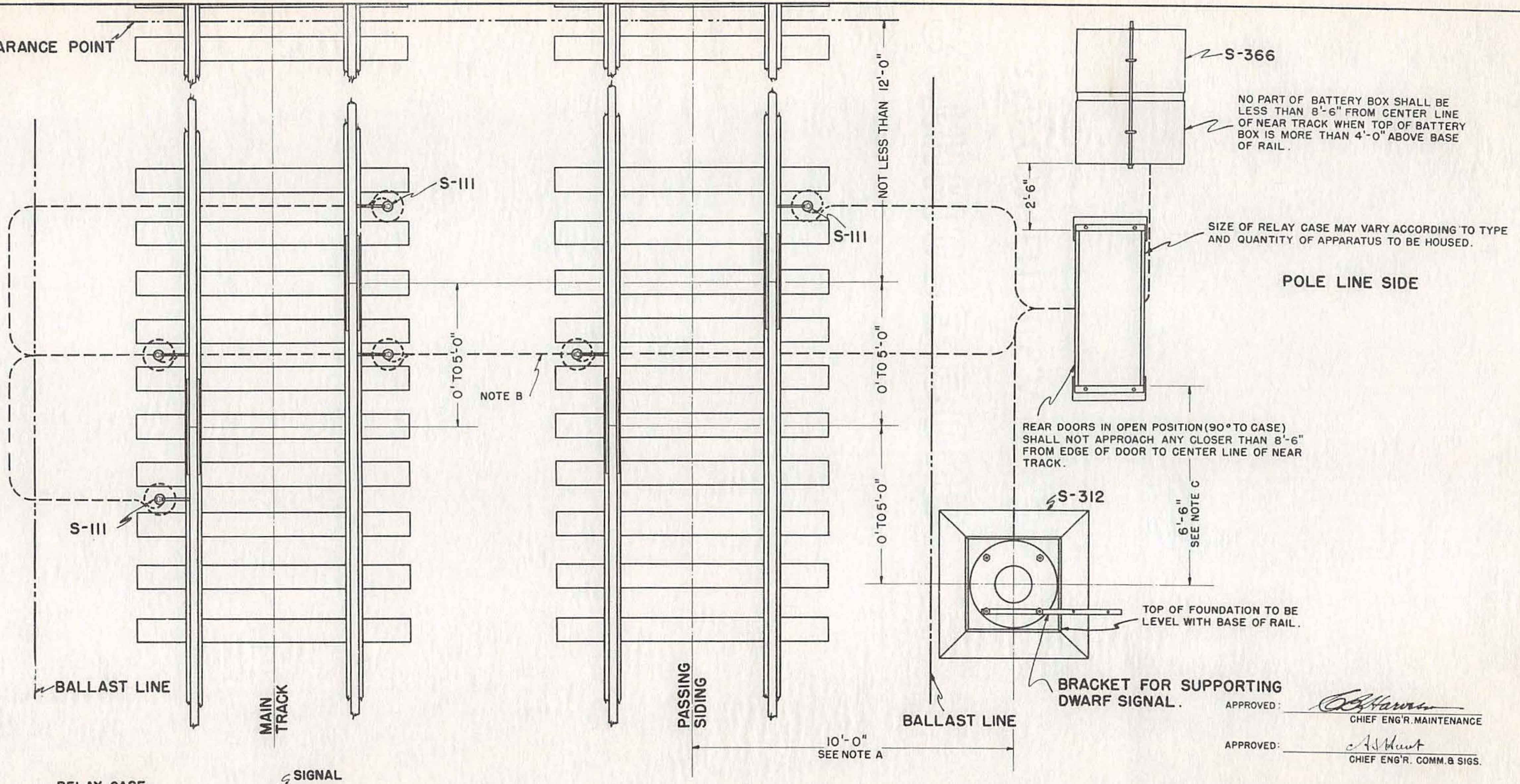
CAST BRONZE CLAMP - 1484
(COPPERWELD CO. NO. 9592 OR EQUIVALENT)

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SECTIONAL GROUND ROD AND FITTINGS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
DEC. 29, 1948

SHEET NO. 1
S-148

RECEIVED
MAY 23 1949
SPECIFICATION DEPT.


CLEARANCE POINT
S-111
S-111
S-111
NOT LESS THAN 12'-0"
0' TO 5'-0"
0' TO 5'-0"
0' TO 5'-0"
NOTE B
S-366
2'-6"
POLE LINE SIDE
S-312
6'-6"
SEE NOTE C
BALLAST LINE
MAIN TRACK
PASSING SIDING
BALLAST LINE
10'-0"
SEE NOTE A

NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.

SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.

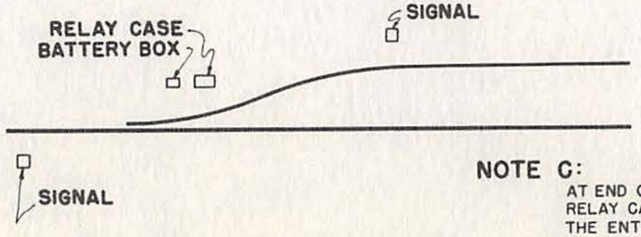
REAR DOORS IN OPEN POSITION (90° TO CASE) SHALL NOT APPROACH ANY CLOSER THAN 8'-6" FROM EDGE OF DOOR TO CENTER LINE OF NEAR TRACK.

TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.

BRACKET FOR SUPPORTING DWARF SIGNAL.

APPROVED: ______
CHIEF ENG'R. MAINTENANCE

APPROVED: ______
CHIEF ENG'R. COMM. & SIGS.


RELAY CASE
BATTERY BOX
SIGNAL
SIGNAL

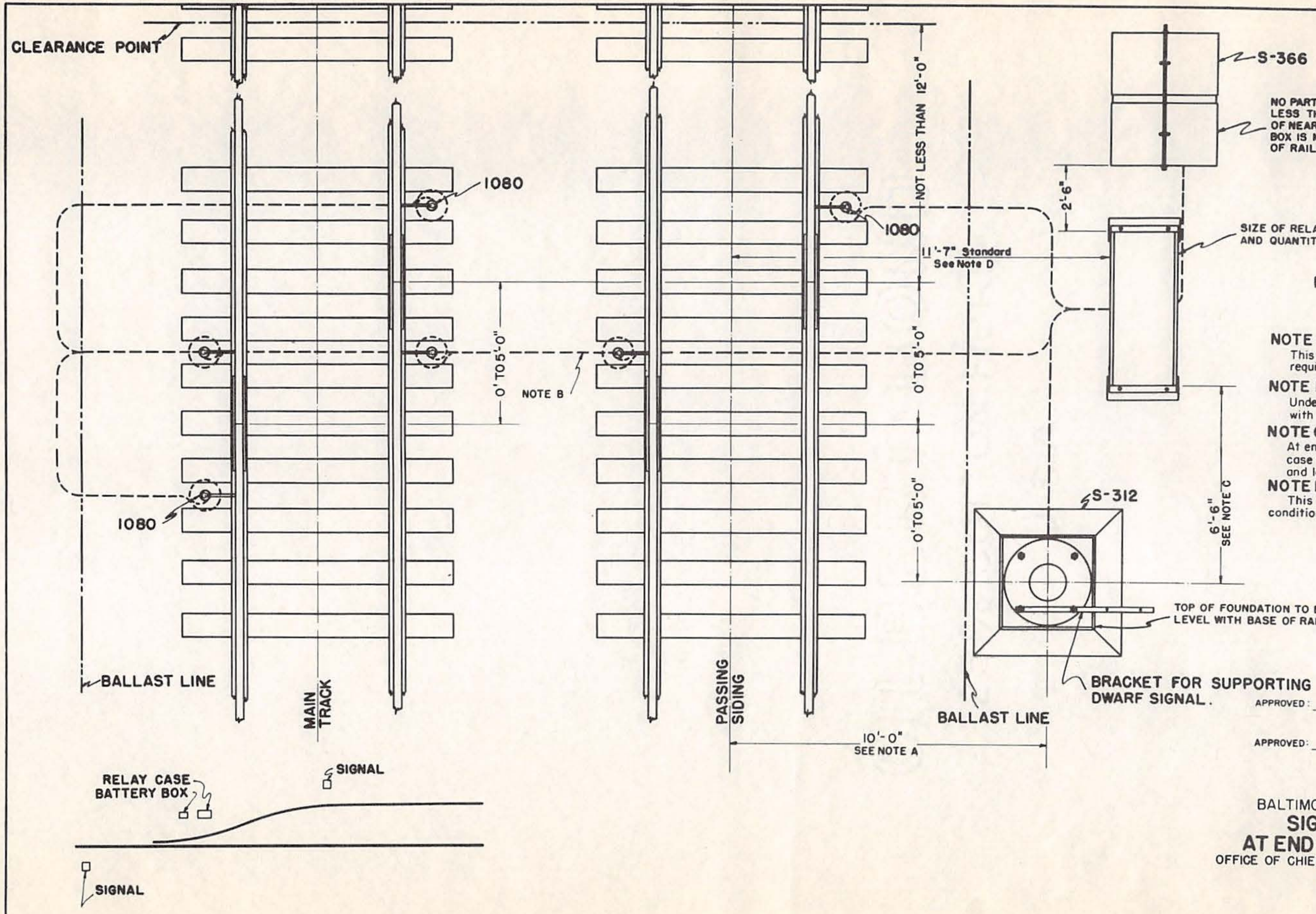
NOTE A:
THIS DISTANCE MAY BE MODIFIED WHERE LOCAL CONDITIONS REQUIRE, BUT SHALL NOT BE LESS THAN 8'-6".

NOTE B:
UNDERGROUND CABLES UNDER TRACKS TO BE NOT LESS THAN 3'-0" BELOW BASE OF RAIL ELSEWHERE NOT LESS THAN 2'-6". THEY SHALL BE SURROUNDED BY 6" OF LOAM, CLAY OR SAND. STONE, CINDERS OR DEBRIS MUST NOT BE PLACED DIRECTLY ON OR NEAR CABLES.

NOTE C:
AT END OF PASSING SIDING SINGLE TRACK, LOCATE RELAY CASE AND BATTERY BOX MIDWAY BETWEEN THE ENTERING AND LEAVING SIGNAL AS SHOWN.

BALTIMORE & OHIO RAILROAD
SIGNAL LOCATION AT END OF PASSING SIDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 29, 1947

S-149


CLEARANCE POINT
1080
1080
1080
NOT LESS THAN 12'-0"
11'-7" Standard
See Note D
0' TO 5'-0"
NOTE B
0' TO 5'-0"
0' TO 5'-0"
S-366
2'-6"
S-312
6'-6"
SEE NOTE C
BALLAST LINE
MAIN TRACK
PASSING SIDING
BALLAST LINE
10'-0"
SEE NOTE A
BRACKET FOR SUPPORTING DWARF SIGNAL.
RELAY CASE
BATTERY BOX
SIGNAL
SIGNAL

NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.

SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.

POLE LINE SIDE

TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.

NOTE A:
This distance may be modified where local conditions require, but shall be not less than 9'-8".

NOTE B:
Underground cables shall be installed in accordance with current instructions I-131.

NOTE C:
At end of passing siding single track, locate relay case and battery box midway between the entering and leaving signal as shown.

NOTE D:
This distance may be increased where physical conditions prevent locating relay case as shown.

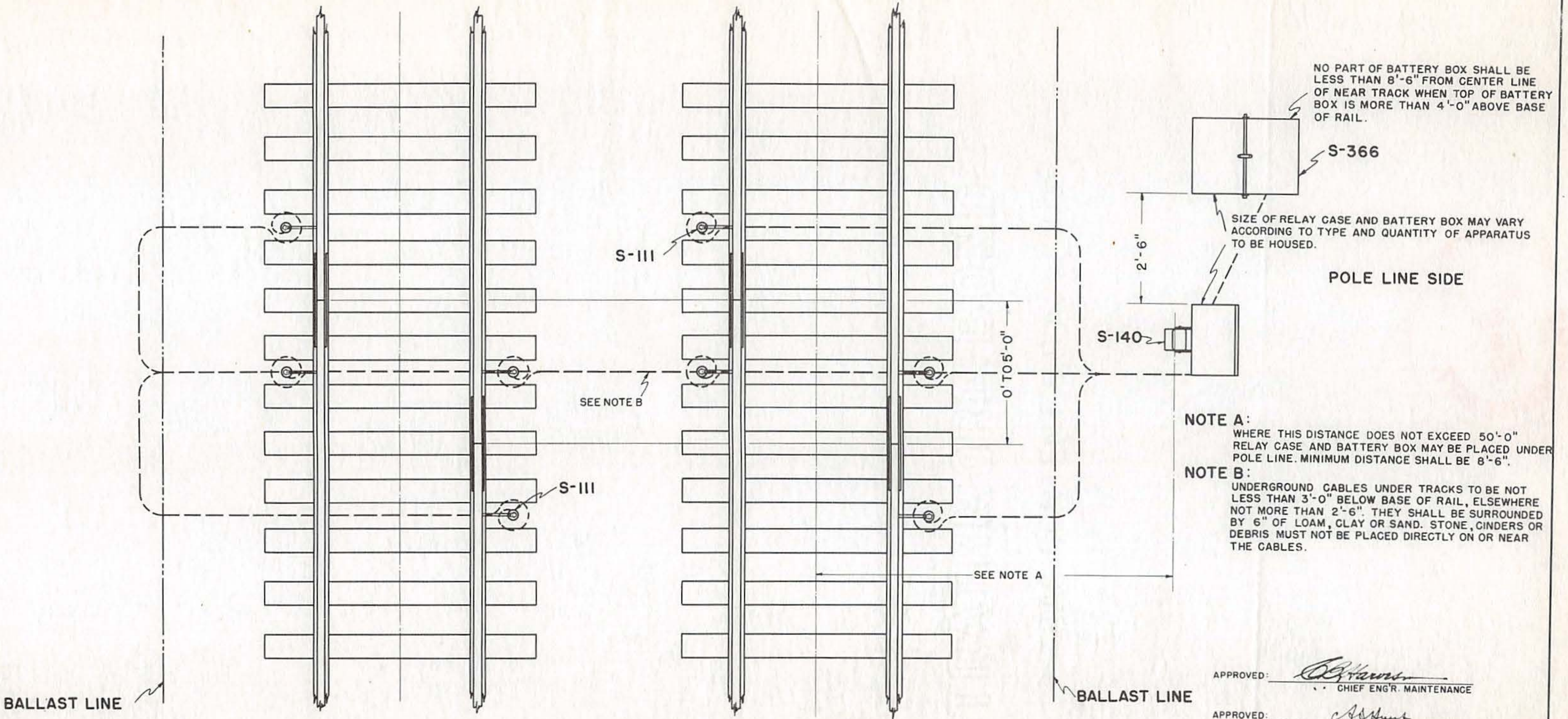
APPROVED: C.B. Harwell
CHIEF ENG'R. MAINTENANCE

APPROVED: A.H. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SIGNAL LOCATION AT END OF PASSING SIDING
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 29, 1947

Revised 3-30-50 account Note D

S-149-A



NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.

SIZE OF RELAY CASE AND BATTERY BOX MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.

NOTE A:

WHERE THIS DISTANCE DOES NOT EXCEED 50'-0" RELAY CASE AND BATTERY BOX MAY BE PLACED UNDER POLE LINE. MINIMUM DISTANCE SHALL BE 8'-6".

NOTE B:

UNDERGROUND CABLES UNDER TRACKS TO BE NOT LESS THAN 3'-0" BELOW BASE OF RAIL, ELSEWHERE NOT MORE THAN 2'-6". THEY SHALL BE SURROUNDED BY 6" OF LOAM, CLAY OR SAND. STONE, CINDERS OR DEBRIS MUST NOT BE PLACED DIRECTLY ON OR NEAR THE CABLES.

APPROVED: C.B. Hawes
CHIEF ENG'R. MAINTENANCE

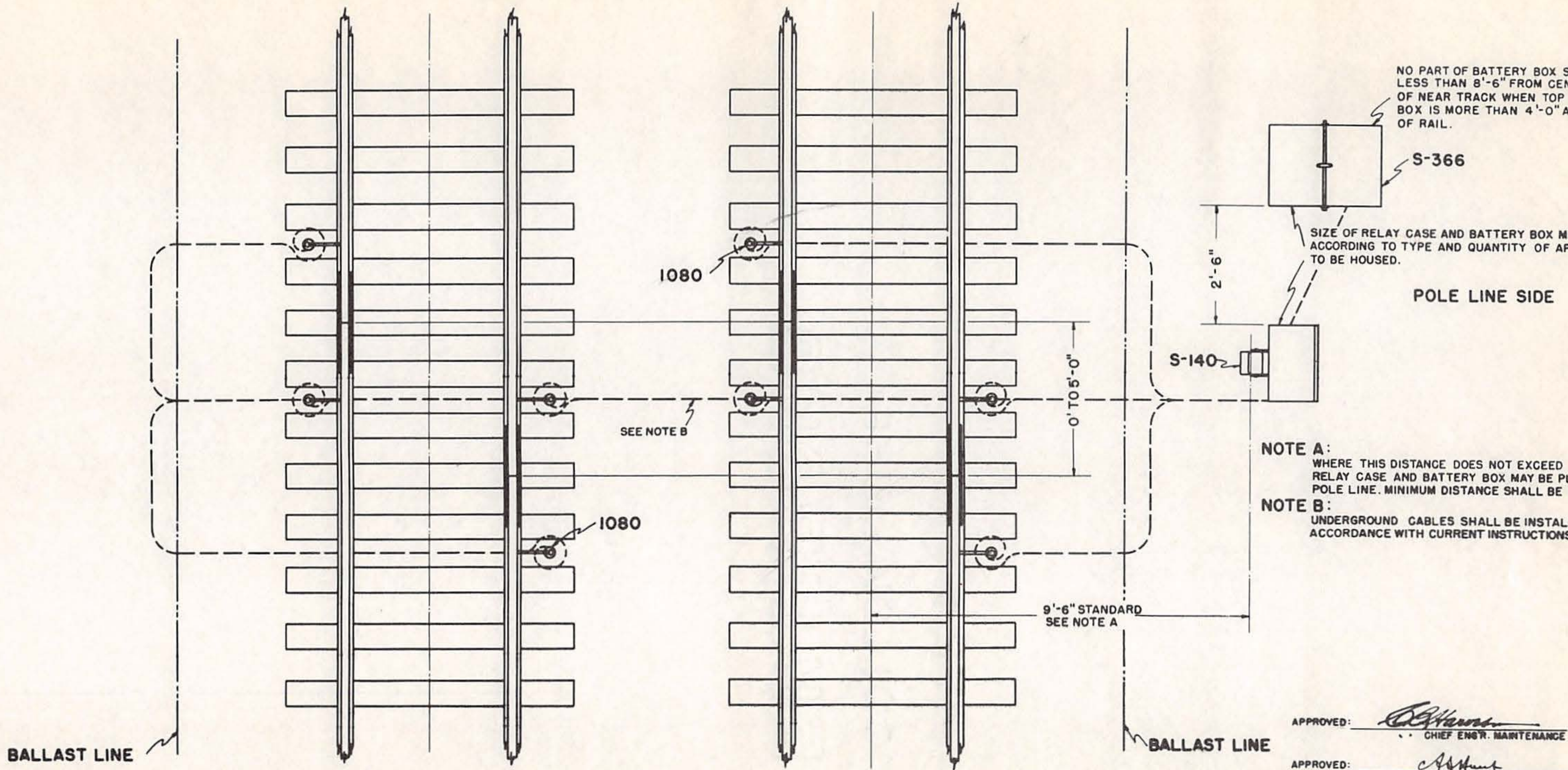
APPROVED: A.H. Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

CUT SECTION LOCATIONS FOR SINGLE OR MULTIPLE TRACK

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 9, 1947

S-150


NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.
S-366
SIZE OF RELAY CASE AND BATTERY BOX MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.
2'-6"
POLE LINE SIDE
S-140
1080
1080
0' TO 5'-0"
SEE NOTE B
9'-6" STANDARD
SEE NOTE A
BALLAST LINE
BALLAST LINE

NOTE A:
WHERE THIS DISTANCE DOES NOT EXCEED 50'-0" RELAY CASE AND BATTERY BOX MAY BE PLACED UNDER POLE LINE. MINIMUM DISTANCE SHALL BE 8'-6".

NOTE B:
UNDERGROUND CABLES SHALL BE INSTALLED IN ACCORDANCE WITH CURRENT INSTRUCTIONS I-131.

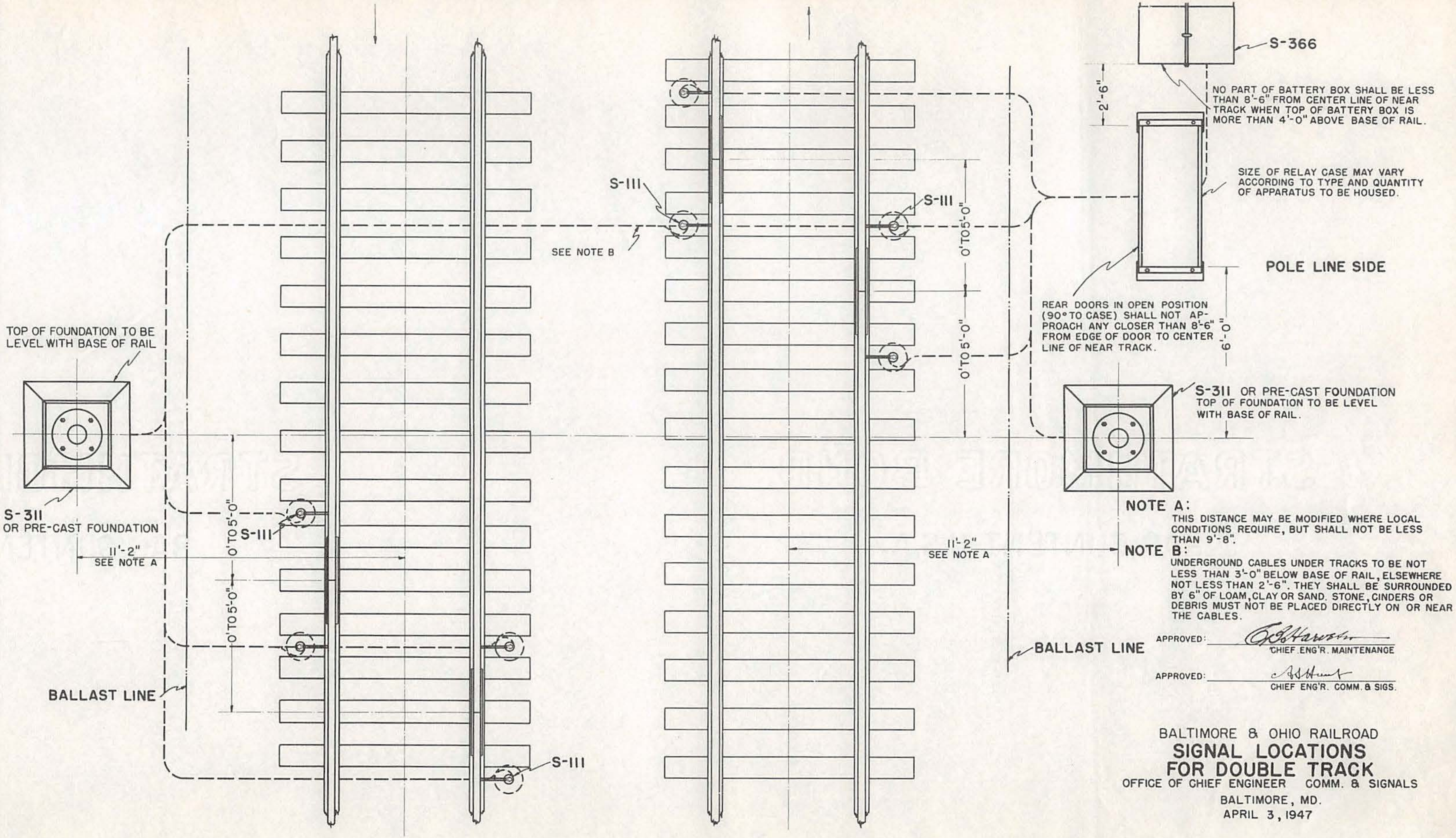
APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
CUT SECTION LOCATIONS FOR SINGLE OR MULTIPLE TRACK
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 9, 1947

S-150A

8-30-50: Note A revised.


S-366
NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.
2'-6"
SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.
S-III
S-III
SEE NOTE B
0'TO 5'-0"
POLE LINE SIDE
REAR DOORS IN OPEN POSITION (90° TO CASE) SHALL NOT APPROACH ANY CLOSER THAN 8'-6" FROM EDGE OF DOOR TO CENTER LINE OF NEAR TRACK.
0'TO 5'-0"
6'-0"
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL
S-311 OR PRE-CAST FOUNDATION TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.
S-3II
OR PRE-CAST FOUNDATION
0'TO 5'-0"
S-III
11'-2"
SEE NOTE A
11'-2"
SEE NOTE A
0'TO 5'-0"
BALLAST LINE
BALLAST LINE
S-III

NOTE A:

THIS DISTANCE MAY BE MODIFIED WHERE LOCAL CONDITIONS REQUIRE, BUT SHALL NOT BE LESS THAN 9'-8".

NOTE B:

UNDERGROUND CABLES UNDER TRACKS TO BE NOT LESS THAN 3'-0" BELOW BASE OF RAIL, ELSEWHERE NOT LESS THAN 2'-6". THEY SHALL BE SURROUNDED BY 6" OF LOAM, CLAY OR SAND. STONE, CINDERS OR DEBRIS MUST NOT BE PLACED DIRECTLY ON OR NEAR THE CABLES.

APPROVED: ____________
CHIEF ENG'R. MAINTENANCE

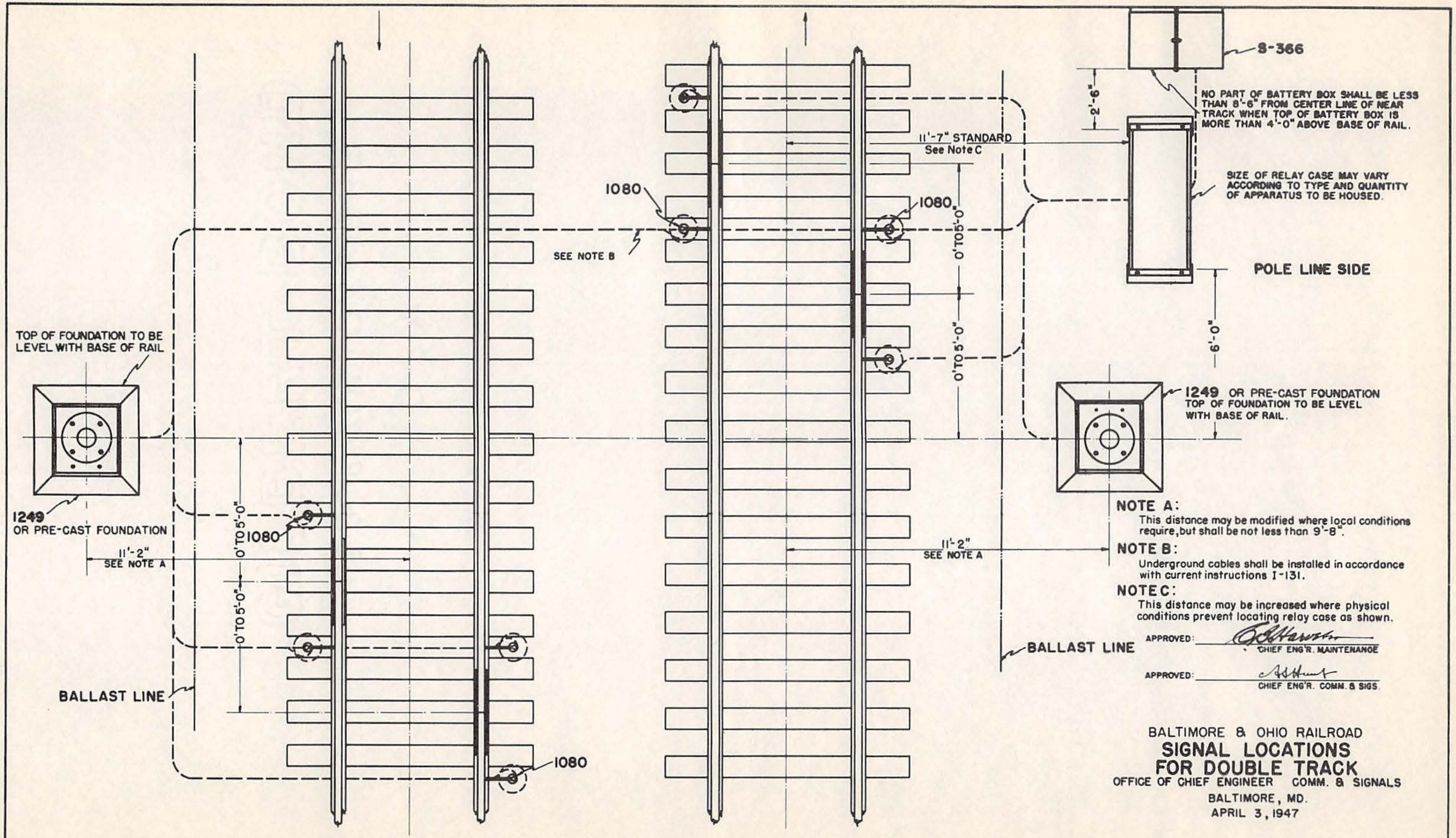
APPROVED: ____________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

SIGNAL LOCATIONS FOR DOUBLE TRACK

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 3, 1947

S-151


S-366
NO PART OF BATTERY BOX SHALL BE LESS THAN 8'-6" FROM CENTER LINE OF NEAR TRACK WHEN TOP OF BATTERY BOX IS MORE THAN 4'-0" ABOVE BASE OF RAIL.
2'-6"
11'-7" STANDARD
See Note C
SIZE OF RELAY CASE MAY VARY ACCORDING TO TYPE AND QUANTITY OF APPARATUS TO BE HOUSED.
1080
1080
SEE NOTE B
0' TO 5'-0"
0' TO 5'-0"
POLE LINE SIDE
6'-0"
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL
1249 OR PRE-CAST FOUNDATION
TOP OF FOUNDATION TO BE LEVEL WITH BASE OF RAIL.
1249
OR PRE-CAST FOUNDATION
0' TO 5'-0"
1080
11'-2"
SEE NOTE A
0' TO 5'-0"
11'-2"
SEE NOTE A
BALLAST LINE
BALLAST LINE
1080

NOTE A:
This distance may be modified where local conditions require, but shall be not less than 9'-8".

NOTE B:
Underground cables shall be installed in accordance with current instructions I-131.

NOTE C:
This distance may be increased where physical conditions prevent locating relay case as shown.

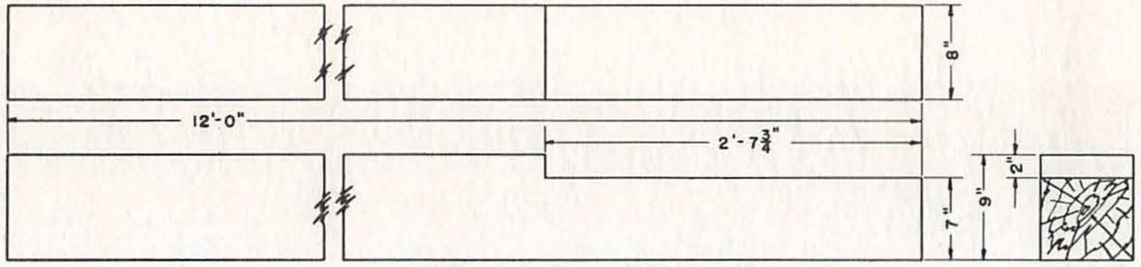
APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

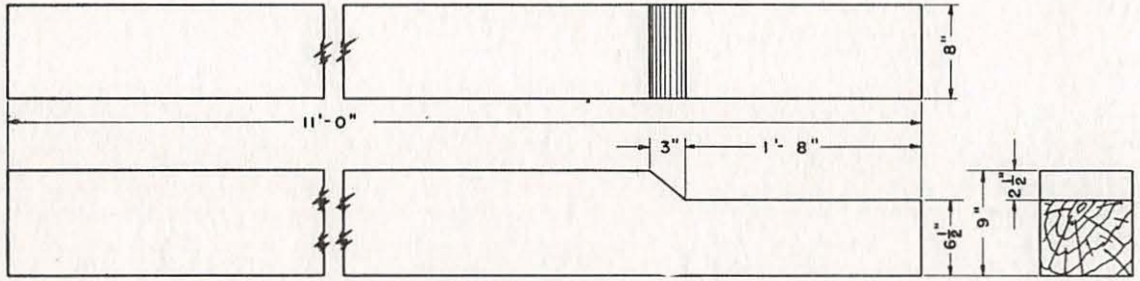
BALTIMORE & OHIO RAILROAD
SIGNAL LOCATIONS FOR DOUBLE TRACK
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 3, 1947

S-151-A

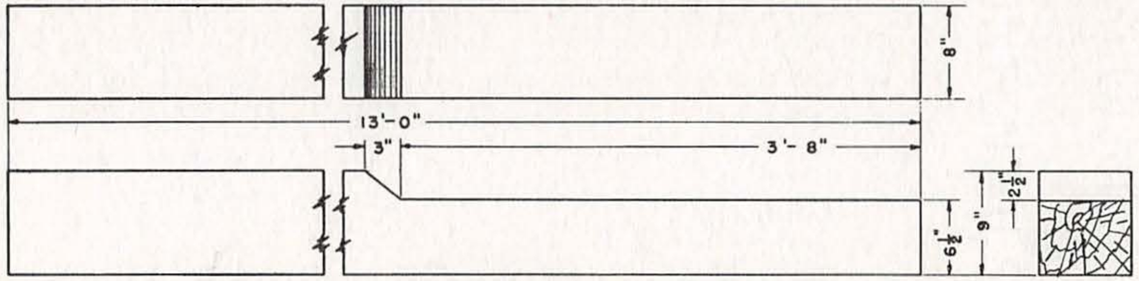
Revised 3-30-50: account si ndation
and Note C.



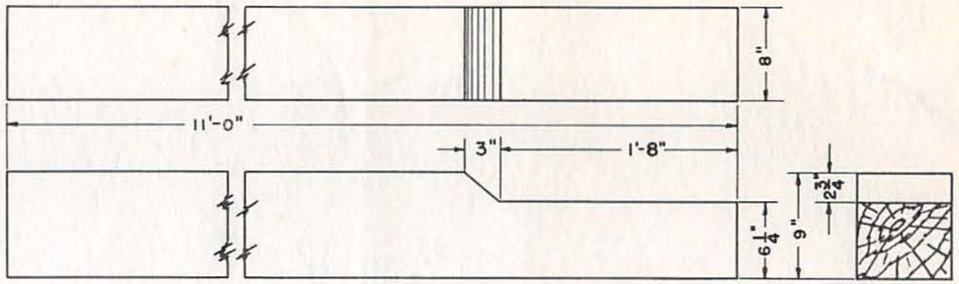
SAWED OAK SWITCH TIE - 1520



SAWED OAK SWITCH TIE - 1521



SAWED OAK SWITCH TIE - 1522



SAWED OAK SWITCH TIE - 1523

TIES REQUIRED FOR ONE SWITCH LAYOUT				
SWITCH MACHINE	1520	1521	1522	1523
MODEL 5A-B-C OR D SWITCH MACHINE	2			
STYLE "M2" ELECTRIC ENCLOSED S.& L. MOVEMENT	2			
STYLE "M20" DUAL CONTROL S.& L. MOVEMENT	2			
STYLE "M22A OR B" DUAL CONTROL S.& L. MOVEMENT	2			
STYLE "A1" E.P.S.&L. MOVEMENT WITH CIRCUIT CONTROLLER		2	1	1
STYLE "A5" E.P.S.&L. MOVEMENT		3		1

APPROVED: ____________
CHIEF ENG'R. MAINTENANCE

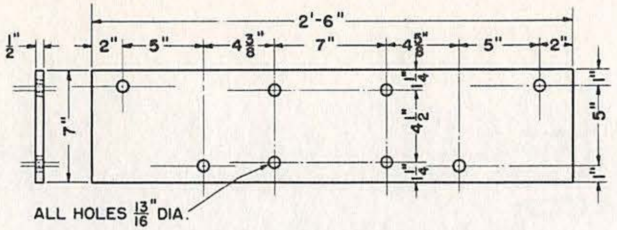
APPROVED: ____________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SPECIAL SWITCH TIES
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 4, 1948

SHEET NO. 1

S-152

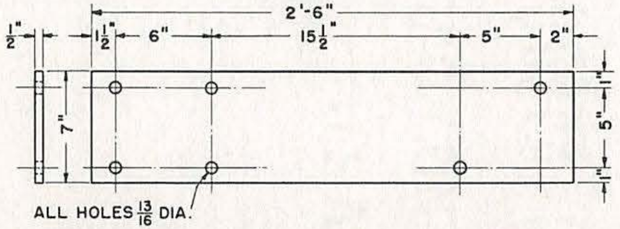
RECEIVED
JUN 7 1948
SPECIFICATION DEPT.


2'-6"
1/2"
2"
5"
4 3/8"
7"
4 5/8"
5"
2"
1 1/4"
4 1/2"
1 1/4"
7"
1"
5"
1"

ALL HOLES 13/16" DIA.

BASE PLATE FOR PLUNGER SWITCH LOCK - 1530

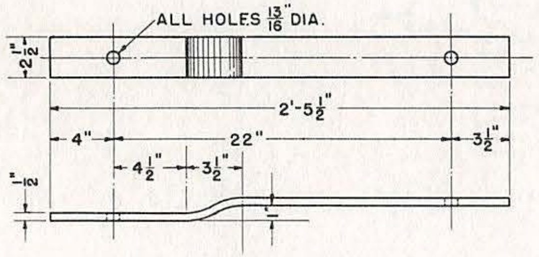
O.H.STEEL


2'-6"
1/2"
1 1/2"
6"
15 1/2"
5"
2"
7"
1"
5"
1"

ALL HOLES 13/16 DIA.

BASE PLATE FOR HOR. CRANK STAND - 1530-1

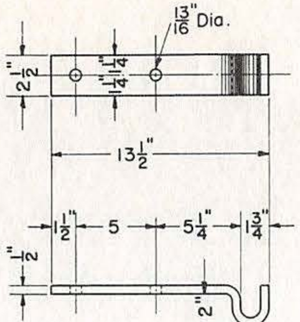
O.H.STEEL


2 1/2"
2'-5 1/2"
4"
22"
3 1/2"
4 1/2"
3 1/2"
1/2"

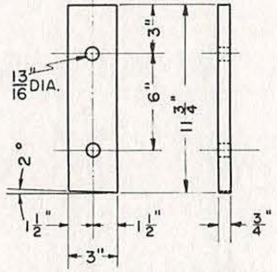
ALL HOLES 13/16" DIA.

TIE STRAP - 1531-5

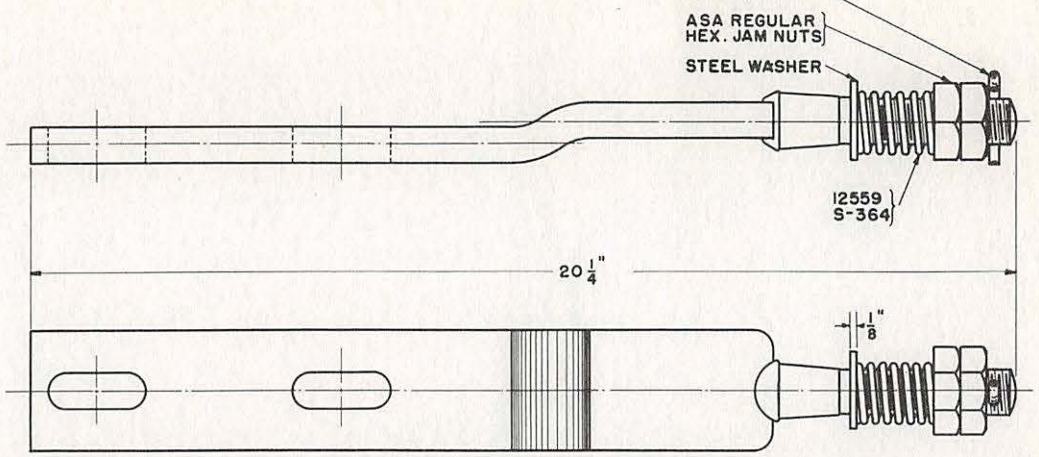
O.H.STEEL


13/16" Dia.
2 1/2"
1 1/4"
1 1/4"
13 1/2"
1 1/2"
5
5 1/4"
1 3/4"
1/2"
2"

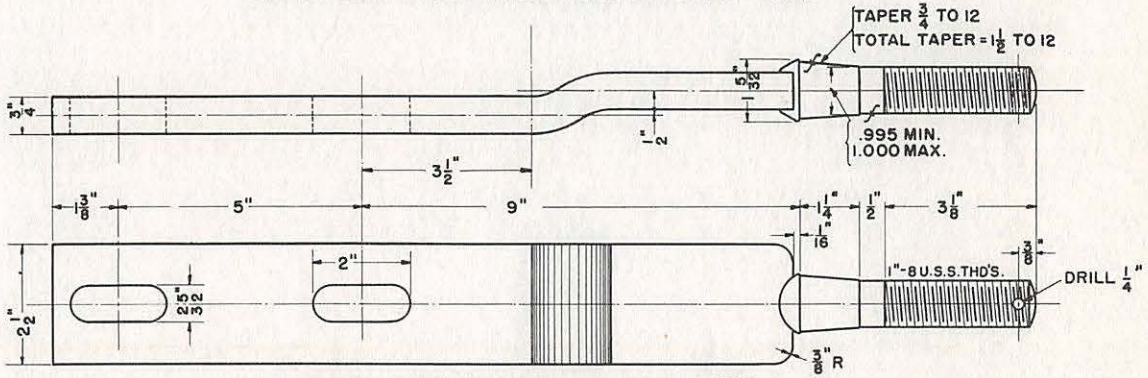
GUIDE - 1533


13/16" DIA.
3"
6"
11 3/4"
2°
1 1/2"
1 1/2"
3"
3/4"

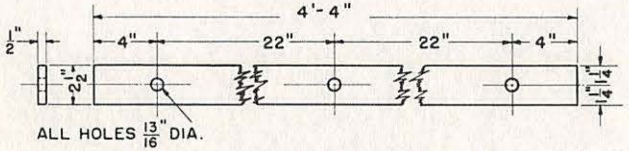
STOP PLATE - 15316


1/4" x 1 3/4" COTTER
ASA REGULAR HEX. JAM NUTS
STEEL WASHER
12559
S-364
20 1/4"
1/8"

SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY - 1532


TAPER 3/4 TO 12
TOTAL TAPER = 1 1/2 TO 12
1 5/32
3/4"
1/2"
.995 MIN.
1.000 MAX.
3 1/2"
1 3/8"
5"
9"
1 1/4"
1/2"
3 1/8"
1/16"
3/8"
2"
25/32"
2 1/2"
1"-8 U.S.S. THD'S.
DRILL 1/4"
3/8" R

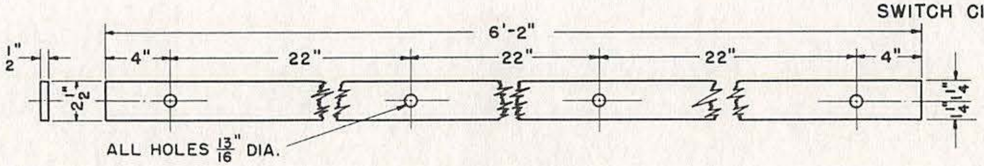
SWITCH CIRCUIT CONTROLLER LUG - 1532-1


4'-4"
1/2"
4"
22"
22"
4"
2 1/2"
1 1/4"
1 1/4"

ALL HOLES 13/16" DIA.

TIE STRAP - 1531-1

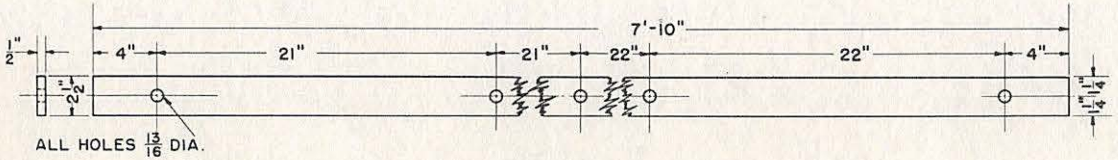
O.H.STEEL


6'-2"
1/2"
4"
22"
22"
22"
4"
2 1/2"
1 1/4"
1 1/4"

ALL HOLES 13/16" DIA.

TIE STRAP - 1531-3

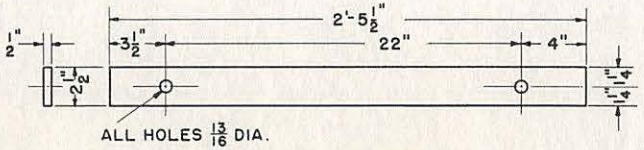
O.H.STEEL


7'-10"
1/2"
4"
21"
21"
22"
22"
4"
2 1/2"
1 1/4"
1 1/4"

ALL HOLES 13/16 DIA.

TIE STRAP - 1531-2

O.H.STEEL


2'-5 1/2"
1/2"
3 1/2"
22"
4"
2 1/2"
1 1/4"
1 1/4"

ALL HOLES 13/16 DIA.

TIE STRAP - 1531-4

O.H.STEEL

APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD

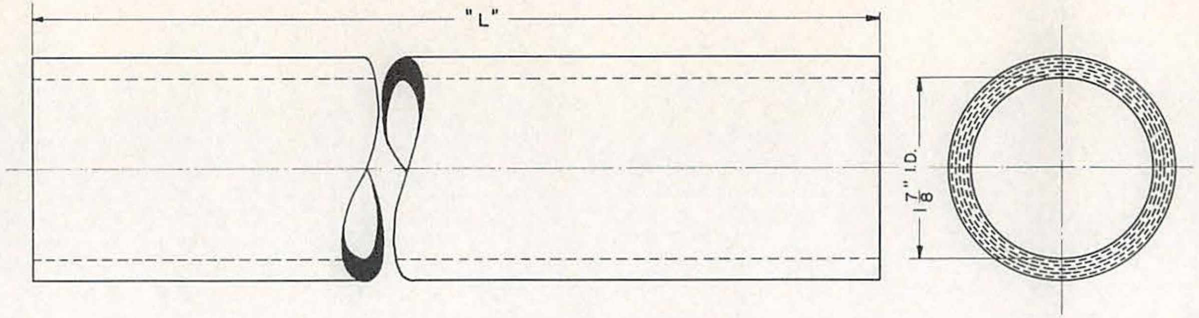
SWITCH FITTINGS

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 8, 1948

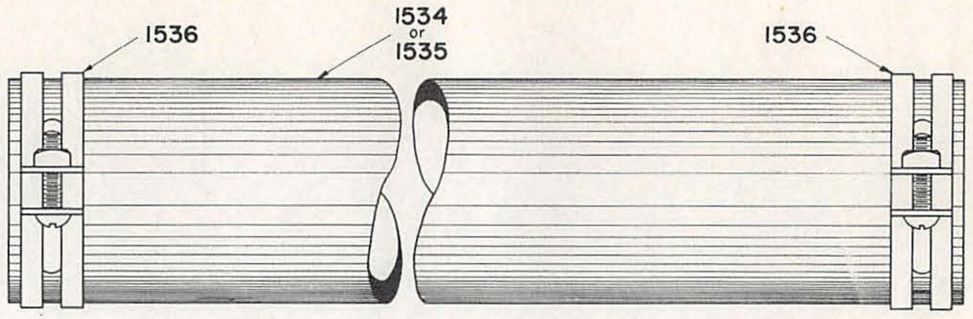
SHEET NO. 1

S-153-C

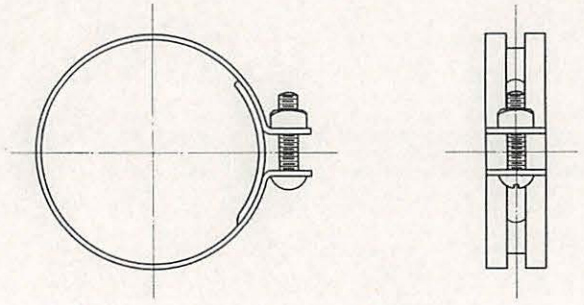
3-25-49 GUIDE 1533 ADDED.
8-29-50: Stop Plate 15316 added.
12-20-51. Revised account 13/16" hole dimension added to 1533.



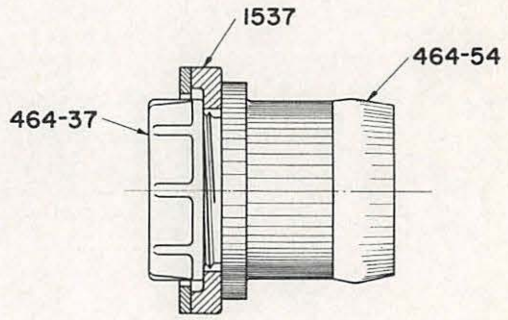
5-PLY RUBBER HOSE "L" = 18"- **1534**
5-PLY RUBBER HOSE "L" = 24"- **1535**


1536
1534
or
1535
1536

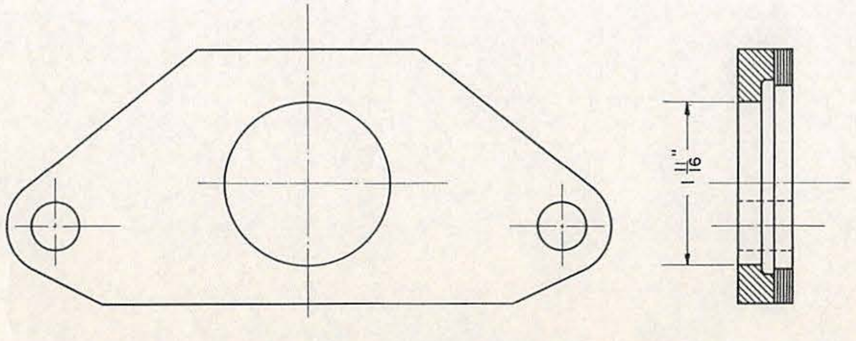
RUBBER CONDUIT ASSEMBLY USING 1534 - **15311**
RUBBER CONDUIT ASSEMBLY USING 1535 - **15312**



$1\frac{7}{8}$" HOSE CLAMP - **1536**


1537
464-54
464-37

NO. 464-32 RACO HOSE ADAPTER ASSEMBLY - **1538**



NO. 464-26 RACO ADAPTER & GASKET ASSEMBLY - **1537**

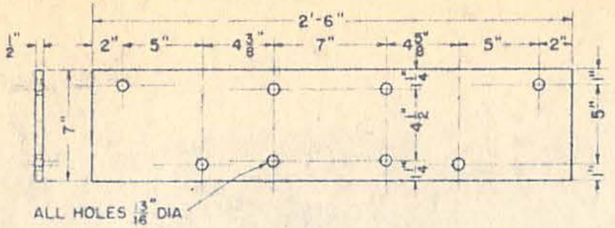
Adopted 4-26-50
Revised 8-28-50 account size of hose changed.
12-20-51: Raco reference changed on 1537.

Approved: ______________________
Chief Engr. Comm. & Sigs.

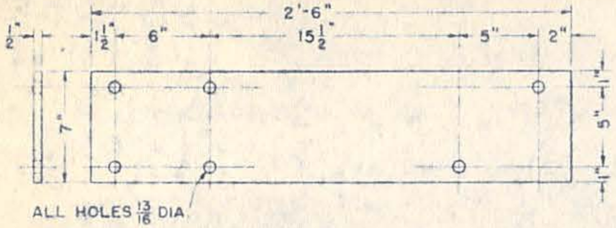
BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Aug. 28, 1950.

Sheet No. 2

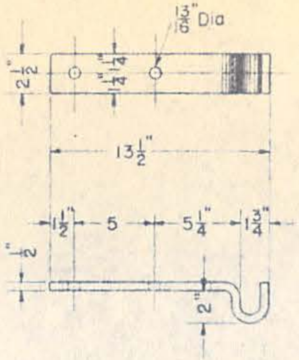
S-153-C


2'-6"
1/2"
2"
5"
4 3/8"
7"
4 5/8"
5"
2"
7"
5"
1 1/4"
4 1/2"
1 1/4"
1"
1"
ALL HOLES 13/16" DIA

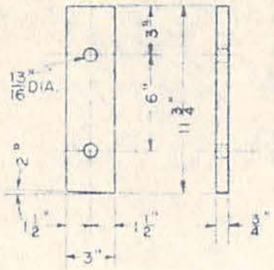
BASE PLATE FOR PLUNGER SWITCH LOCK - 1530
O.H. STEEL


2'-6"
1/2"
1 1/2"
6"
15 1/2"
5"
2"
7"
5"
1"
1"
ALL HOLES 13/16 DIA

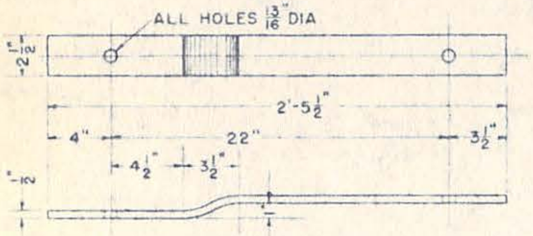
BASE PLATE FOR HOR. CRANK STAND - 1530-1
O.H. STEEL


13/16" Dia
2 1/2"
1 1/4"
1 1/4"
13 1/2"
1 1/2"
5
5 1/4"
1 3/4"
1/2"
2"

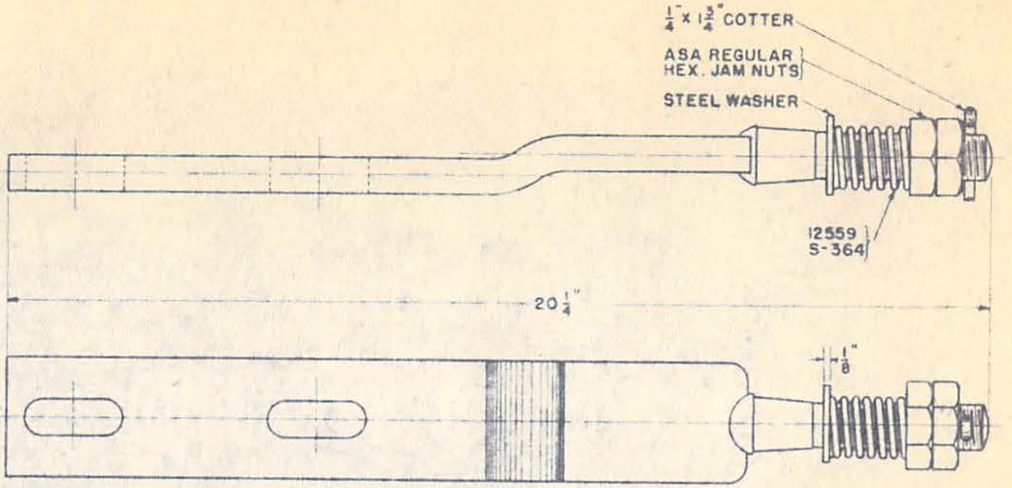
GUIDE - 1533


13/16" DIA.
3 5/8"
6"
11 3/4"
2"
1 1/2"
1 1/2"
3"
3/4"

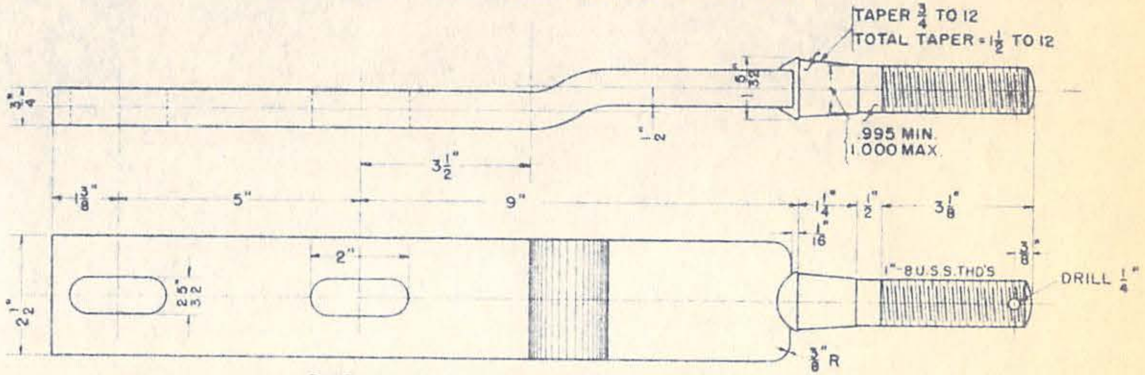
STOP PLATE - 15316


ALL HOLES 13/16" DIA
2 1/2"
2'-5 1/2"
4"
22"
3 1/2"
4 1/2"
3 1/2"
1/2"
1"

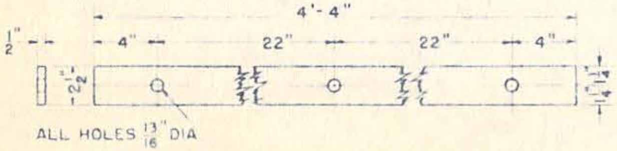
TIE STRAP - 1531-5
O.H. STEEL


1/4" x 1 3/4" COTTER
ASA REGULAR
HEX. JAM NUTS
STEEL WASHER
12559
S-364
20 1/4"
1/8"

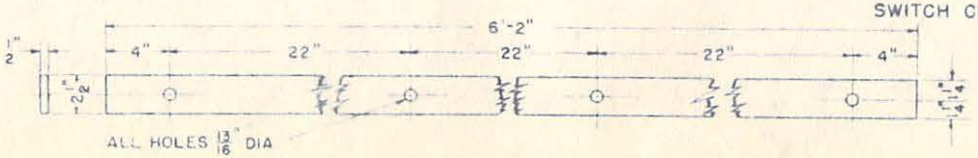
SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY - 1532


TAPER 3/4 TO 12
TOTAL TAPER = 1 1/2 TO 12
3/4"
5/32"
1/2"
.995 MIN.
1.000 MAX.
3 1/2"
1 3/8"
5"
9"
1 1/4"
1/2"
3 1/8"
1/16"
3/8"
2"
25/32"
2 1/2"
1"-8 U.S.S. THD'S
DRILL 1/4"
3/8" R

SWITCH CIRCUIT CONTROLLER LUG - 1532-1


4'-4"
1/2"
4"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16" DIA

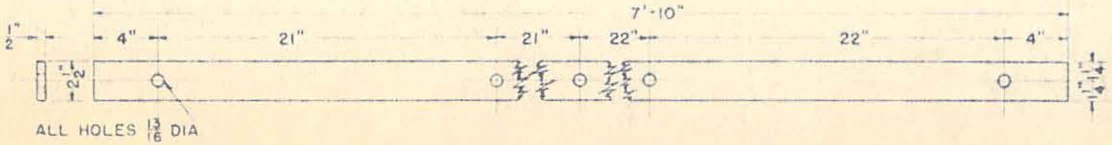
TIE STRAP - 1531-1
O.H. STEEL


6'-2"
1/2"
4"
22"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16" DIA

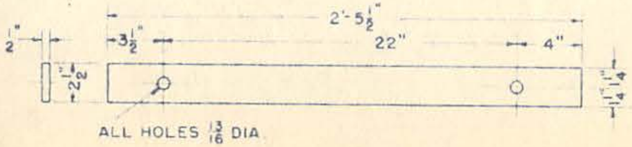
TIE STRAP - 1531-3
O.H. STEEL

APPROVED
Chief Eng'r Maintenance

APPROVED A. L. Jordan
Signal Engineer


7'-10"
1/2"
4"
21"
21"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16 DIA

TIE STRAP - 1531-2
O.H. STEEL


2'-5 1/2"
1/2"
3 1/2"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16 DIA

TIE STRAP - 1531-4
O.H. STEEL

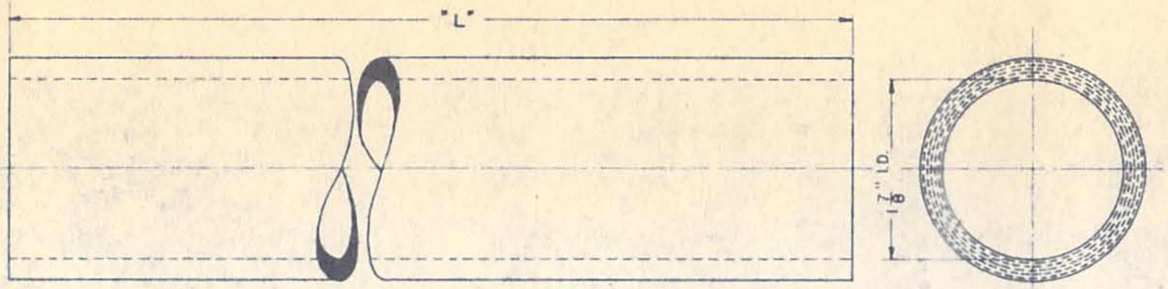
BALTIMORE & OHIO RAILROAD

SWITCH FITTINGS

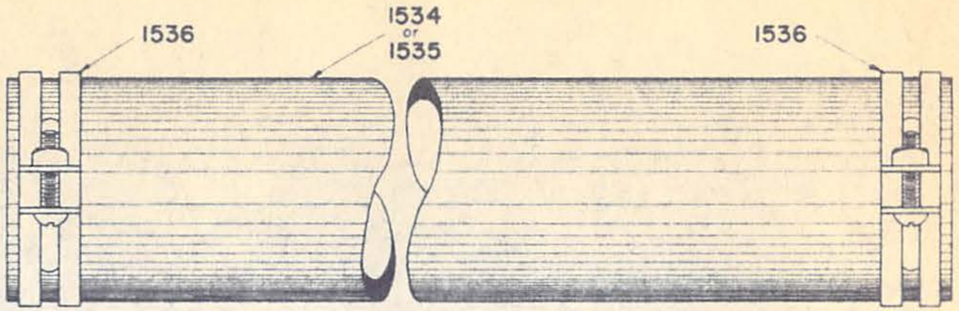
Office of Signal Engineer
Baltimore, Md
JAN 8, 1948

SHEET NO 1 S-153-F

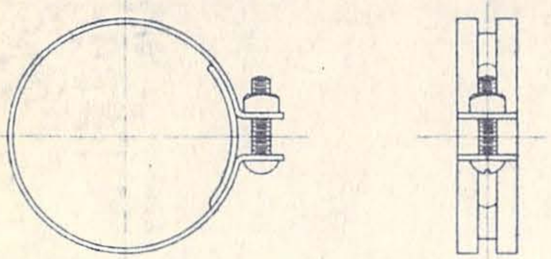
3-25-49 GUIDE 1533 ADDED
8-29-50 Stop Plate 15316 added
12-20-51 Revised account 13/16" h
dimension added to 1533



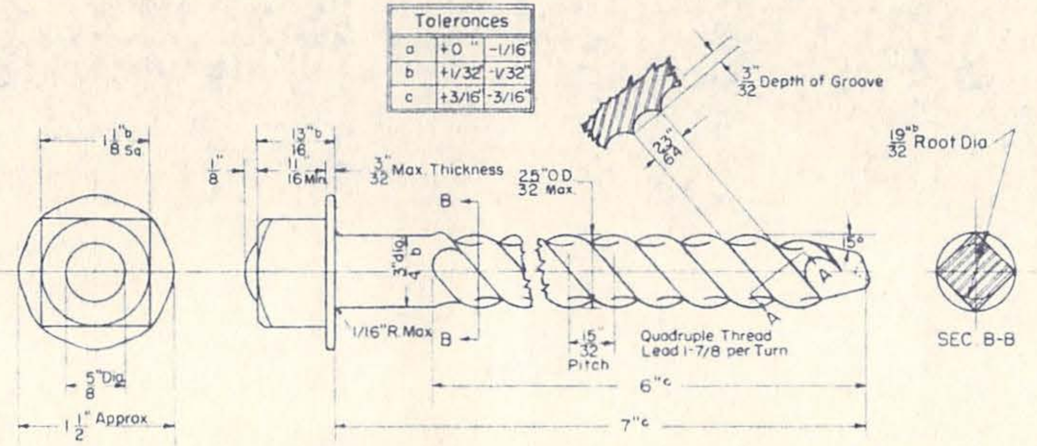
5-PLY RUBBER HOSE "L" = 18" - 1534
5-PLY RUBBER HOSE "L" = 24" - 1535


1536
1534
or
1535
1536

RUBBER CONDUIT ASSEMBLY USING 1534 - 15311
RUBBER CONDUIT ASSEMBLY USING 1535 - 15312



2-9/16" I.D. HOSE CLAMP FOR 1-7/8" HOSE - 1536

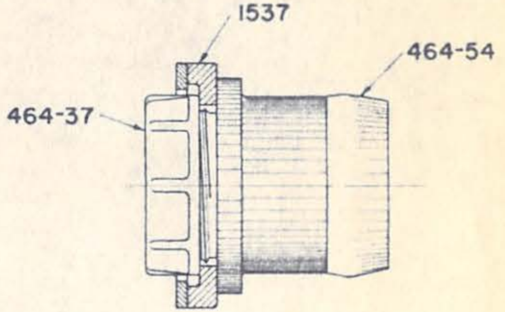

1-1/8" b Sq
5/8" Dia
1-1/2" Approx
1/8"
13/16" b
11/16 Min
3/32" Max Thickness
3/4" dia b
1/16" R Max
B
B
25/32" OD Max
3/32" Depth of Groove
23/64"
19/32" b Root Dia
15°
A
A
15/32" Pitch
Quadruple Thread
Lead 1-7/8 per Turn
6" c
7" c
SEC. B-B

Tolerances		
a	+0"	-1/16"
b	+1/32"	-1/32"
c	+3/16"	-3/16"

GALVANIZED DRIVE SPIKE - 1539

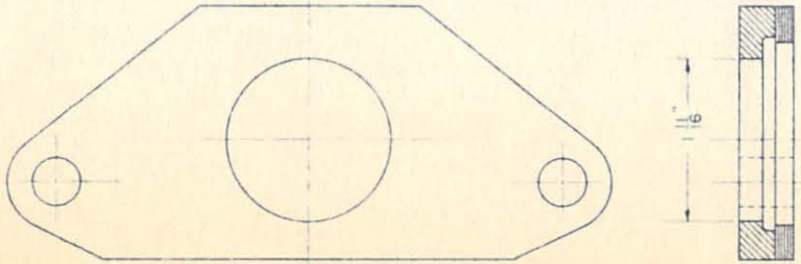
Oliver Iron & Steel Dwg 21-C-361

Spike to conform to A.S.T.M. Spec A-66-33 except as shown


1537
464-54
464-37

NO. 464-32 RACO HOSE ADAPTER ASSEMBLY - 1538

Approved A. L. Jordan
Signal Engineer



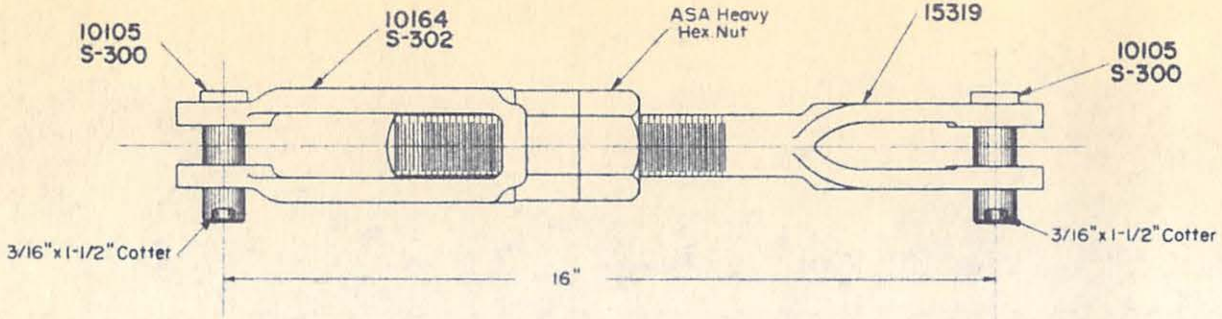
NO 464-26 RACO ADAPTER & GASKET ASSEMBLY - 1537

BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Signal Engineer
Baltimore, Md
Aug. 28, 1950

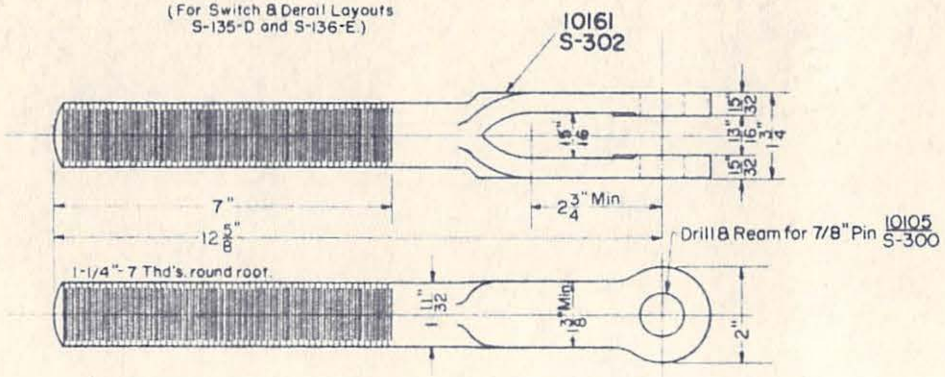
Adopted [illegible]-50
Revised 8-28-50 account size of hose changed
12-20-51 Raco reference changed on 1537
11-5-53 Galv. Drive Spike No 1539 shown
3-29-54 Hose Clamp No 1536 changed

Sheet No 2

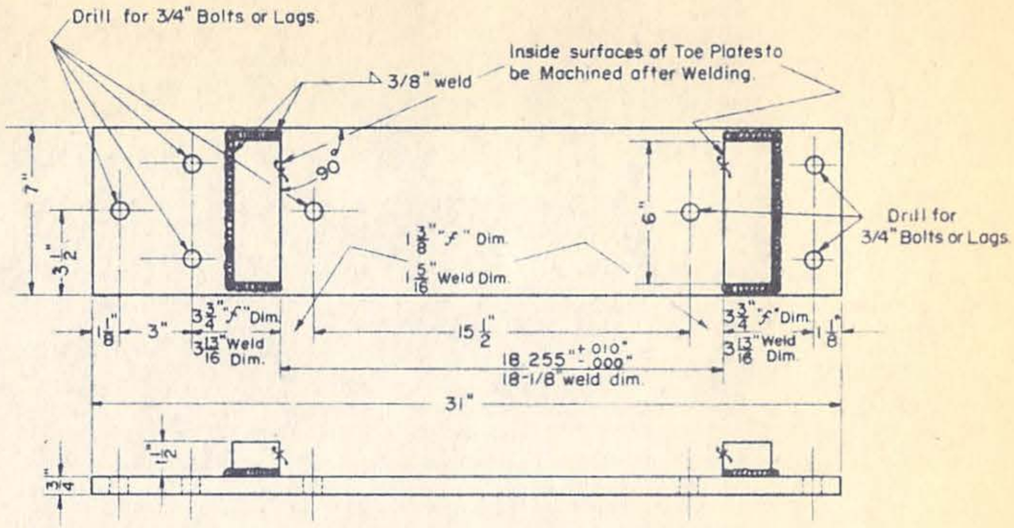
S-153-F


10105
S-300
10164
S-302
ASA Heavy
Hex Nut
15319
10105
S-300
3/16"x1-1/2" Cotter
3/16"x1-1/2" Cotter
16"

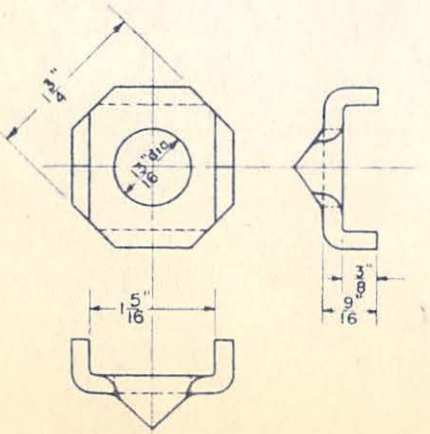
ADJUSTABLE LINK - **15318**
(For Switch & Derail Layouts
S-135-D and S-136-E.)


10161
S-302
15/16"
15/32"
13/16"
15/32"
1 1/4"
7"
2 3/4" Min
12 5/8"
Drill & Ream for 7/8" Pin 10105 S-300
1-1/4"-7 Thd's. round root.
1 11/32"
1 3/8" Min
2"

SOLID JAW - **15319**
C-1020 Steel


Drill for 3/4" Bolts or Lags.
3/8" weld
Inside surfaces of Toe Plates to be Machined after Welding.
90°
Drill for 3/4" Bolts or Lags.
7"
3 1/2"
6"
1 3/8" "f" Dim.
1 5/16" Weld Dim.
1 1/8"
3"
3 3/4" "f" Dim.
3 13/16" Weld Dim.
15 1/2"
18.255" +.010" -.000"
18-1/8" weld dim.
3 3/4" "f" Dim.
3 13/16" Weld Dim.
1 1/8"
31"
1 1/2"
3/4"

SADDLE PLATE - **15317**
GRS No. 42493-46-Gr. I
(For Lap Switch Layout with Model 6 Switch Machine - S-259)


1 3/4"
13/16" dia.
1 5/16"
3/8"
9/16"

RACO BOLT GRIP FOR 3/4" DIA BOLT - **15320**
Material: Hot Rolled Steel - Hot Dip Galvanized

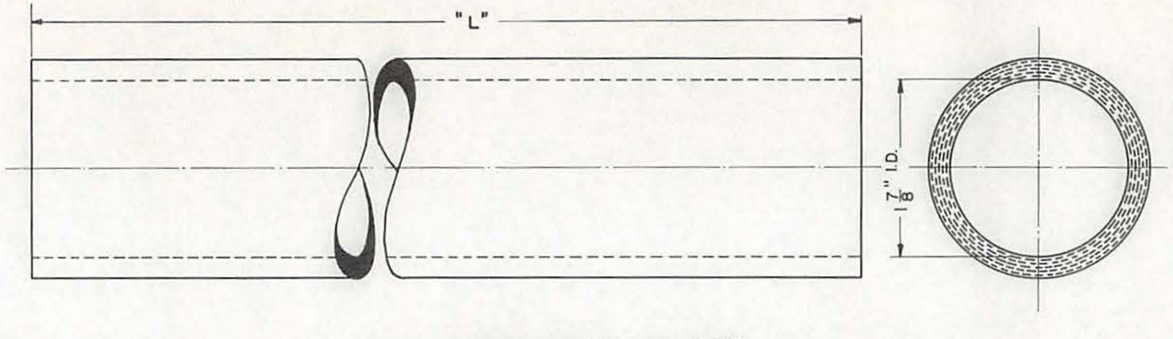
Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Signal Engineer
Baltimore, Md.
Mar. 30, 1953

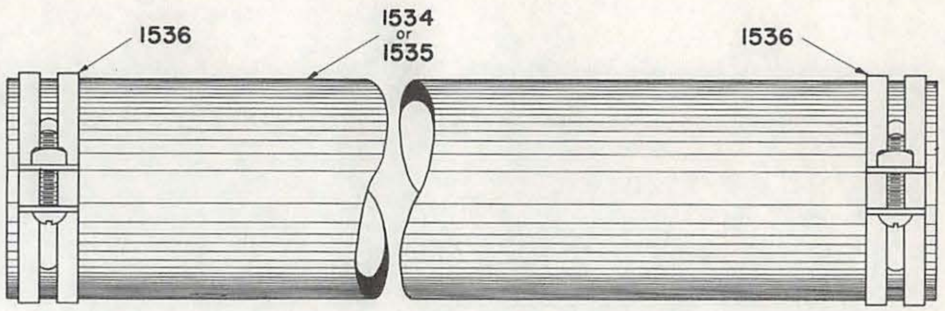
Sheet No. 3

S-153-F

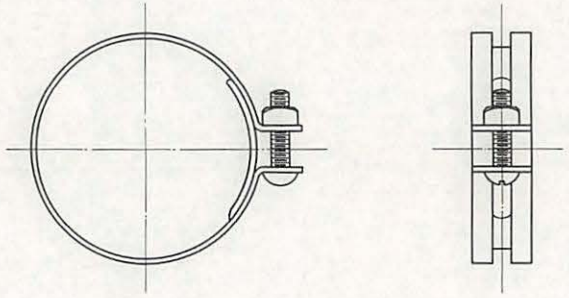
5-17-53 Revised account adding 15320 and note to assembly 15318.



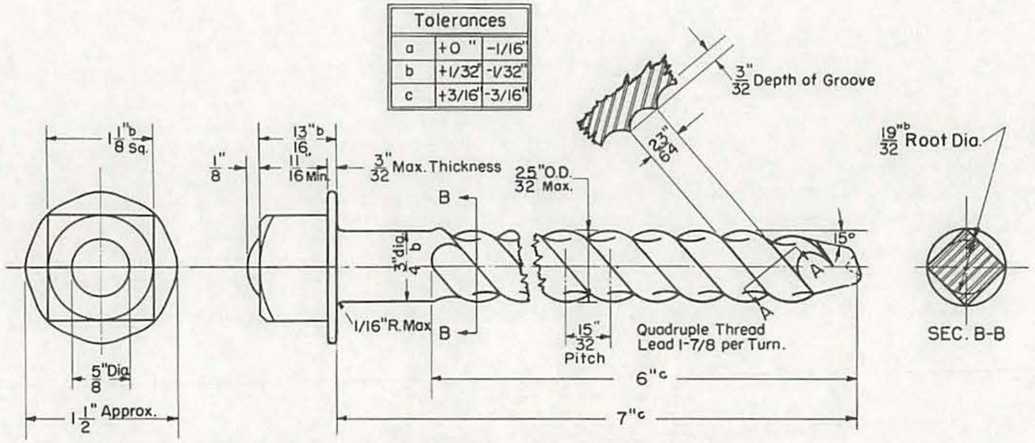
5-PLY RUBBER HOSE "L" = 18" - **1534**
5-PLY RUBBER HOSE "L" = 24" - **1535**


1536
1534
or
1535
1536

RUBBER CONDUIT ASSEMBLY USING 1534 - **15311**
RUBBER CONDUIT ASSEMBLY USING 1535 - **15312**



2-9/16" I.D. HOSE CLAMP FOR 1-7/8" HOSE - 1536

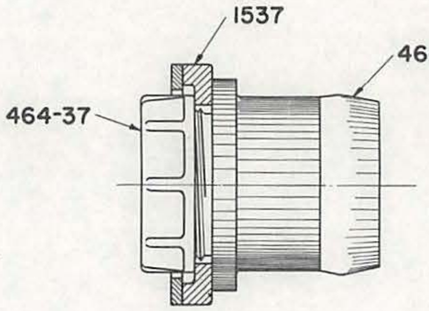

1 1/8" b Sq.
5/8" Dia.
1 1/2" Approx.
1/8"
13/16" b
11/16" Min.
3/32" Max. Thickness
3/4" dia. b
1/16" R. Max
B
B
25/32" O.D. Max.
3/32" Depth of Groove
23/64"
15°
A
A
15/32" Pitch
Quadruple Thread Lead 1-7/8 per Turn.
6" c
7" c
19/32" b Root Dia.
SEC. B-B

Tolerances		
a	+0"	-1/16"
b	+1/32"	-1/32"
c	+3/16"	-3/16"

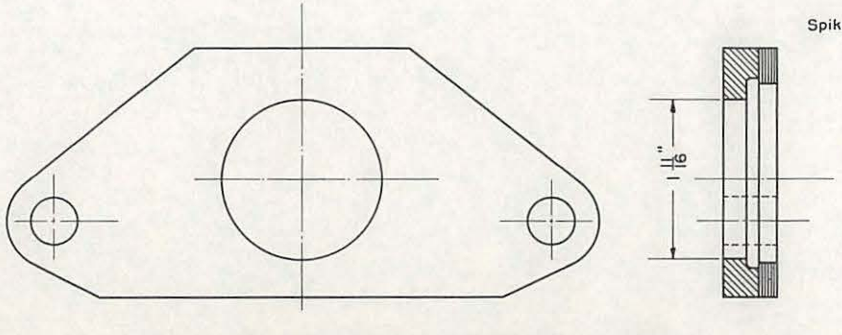
GALVANIZED DRIVE SPIKE - 1539

Oliver Iron & Steel Dwg. 21-C-361

Spike to conform to A.S.T.M. Spec. A-66-33 except as shown


1537
464-54
464-37

NO. 464-32 RACO HOSE ADAPTER ASSEMBLY - **1538**



NO. 464-26 RACO ADAPTER & GASKET ASSEMBLY - **1537**

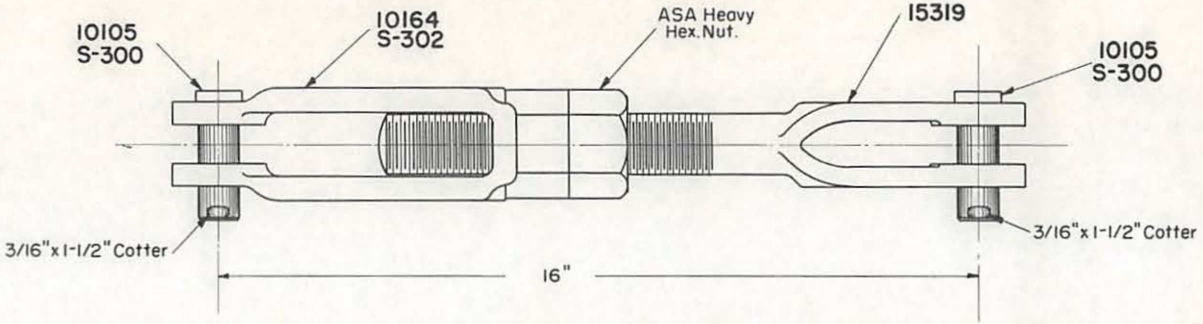
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

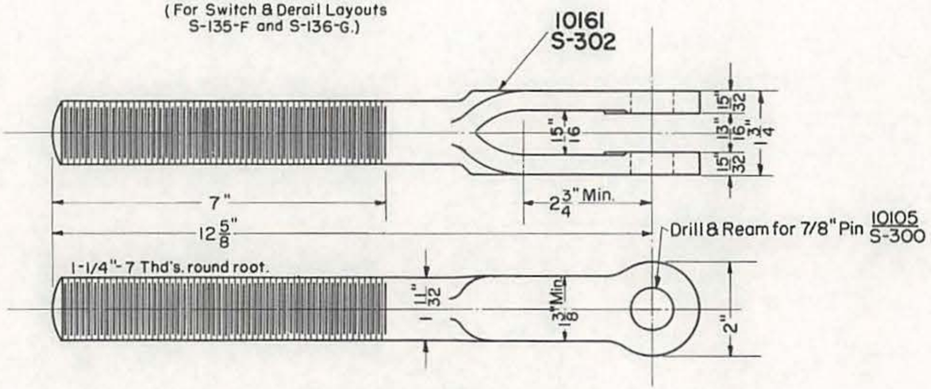
Made & Corrected 4-11-50.
Adopted 4-26-50.
8-28-50: Revised account size of hose changed.
12-20-51: Raco reference changed on 1537.
11-5-53: Galv. Drive Spike No. 1539 shown.
3-29-54: Hose Clamp No. 1536 changed.
12-4-58: 1532 & 1532-1 rev.

Sheet No. 2

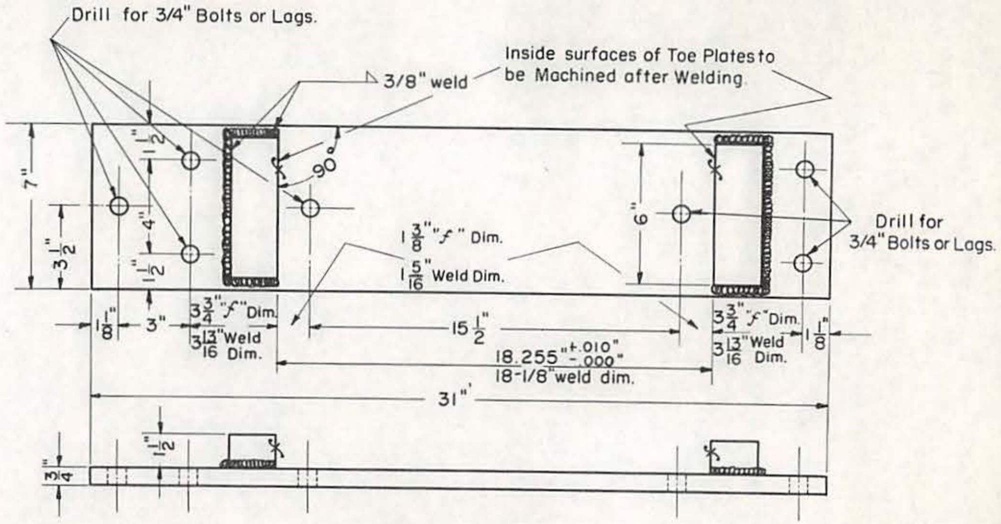
S-153-H


10105
S-300
10164
S-302
ASA Heavy
Hex. Nut.
15319
10105
S-300
3/16"x1-1/2" Cotter
3/16"x1-1/2" Cotter
16"

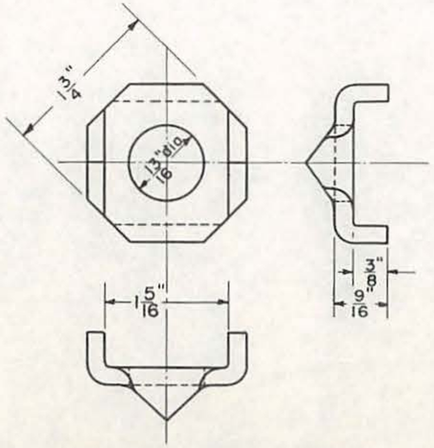
ADJUSTABLE LINK - **15318**
(For Switch & Derail Layouts
S-135-F and S-136-G.)


10161
S-302
15/32"
15/16"
13/16"
1 3/4"
15/32"
7"
2 3/4" Min.
12 5/8"
Drill & Ream for 7/8" Pin 10105/S-300
1-1/4"-7 Thd's. round root.
1 11/32"
1 3/8" Min.
2"

SOLID JAW - **15319**
C-1020 Steel


Drill for 3/4" Bolts or Lags.
3/8" weld
Inside surfaces of Toe Plates to
be Machined after Welding.
7"
3 1/2"
1 1/2"
4"
1 1/2"
90°
1 3/8" "f" Dim.
1 5/16" Weld Dim.
6"
Drill for
3/4" Bolts or Lags.
1 1/8"
3"
3 3/4" "f" Dim.
3 13/16" Weld Dim.
15 1/2"
18.255" +.010" -.000"
18-1/8" weld dim.
3 3/4" "f" Dim.
3 13/16" Weld Dim.
1 1/8"
31"
1/2"
3/4"

SADDLE PLATE - **15317**
GRS No. 42493-46-Gr. I
(For Lap Switch Layout with Model 6 Switch Machine - S-259-A)


1 3/4"
13/16" dia.
1 5/16"
3/8"
9/16"

RACO BOLT GRIP FOR 3/4" DIA. BOLT - **15320**
Material: Hot Rolled Steel - Hot Dip Galvanized

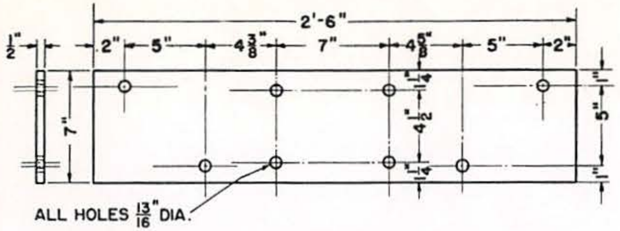
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

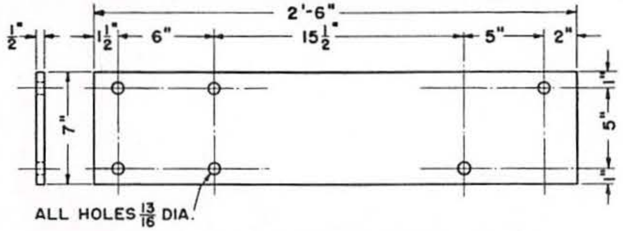
Made & Corrected: 3-30-53.
5-17-53: Revised account adding 15320 ...te
to assembly 15318.
12-4-58: 1532 & 1532-1 rev.

Sheet No. 3

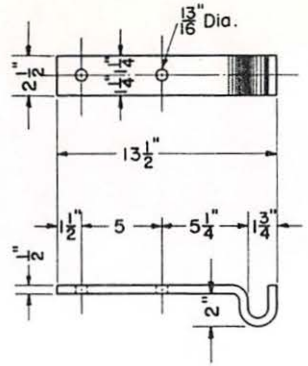
S-153-H


2'-6"
1/2"
2"
5"
4 3/8"
7"
4 5/8"
5"
2"
7"
5"
1"
1 1/4"
4 1/2"
ALL HOLES 13/16" DIA.

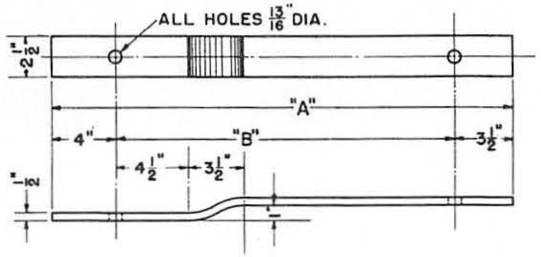
BASE PLATE FOR PLUNGER SWITCH LOCK - 1530
O.H. STEEL


2'-6"
1/2"
1 1/2"
6"
15 1/2"
5"
2"
7"
5"
1"
ALL HOLES 13/16 DIA.

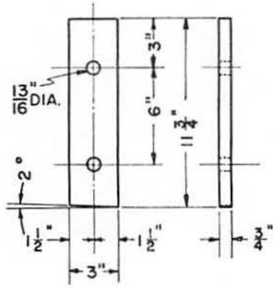
BASE PLATE FOR HOR. CRANK STAND - 1530-1
O.H. STEEL


13/16" Dia.
2 1/2"
1 1/4
13 1/2"
1 1/2"
5
5 1/4"
1 3/4"
1/2"
2"

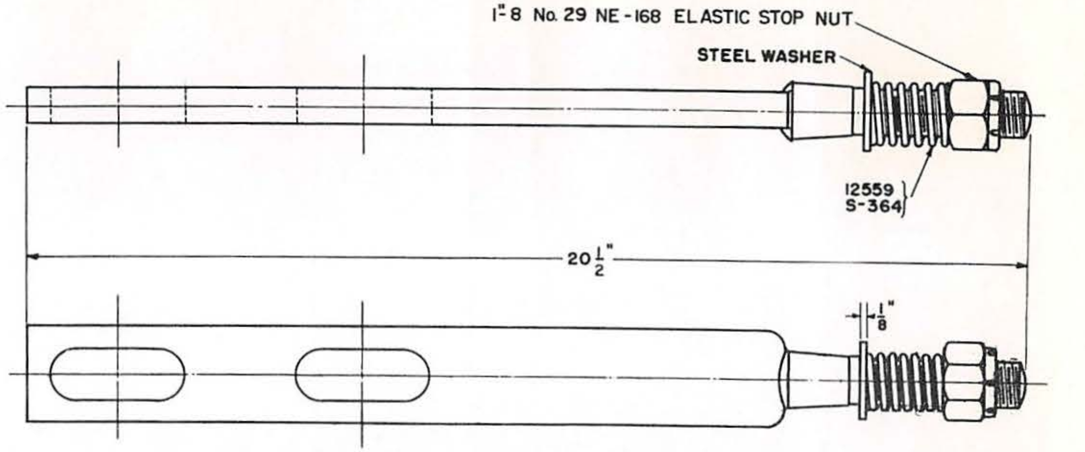
GUIDE - 1533


ALL HOLES 13/16" DIA.
2 1/2"
"A"
4"
"B"
3 1/2"
4 1/2"
3 1/2"
1/2"
1"

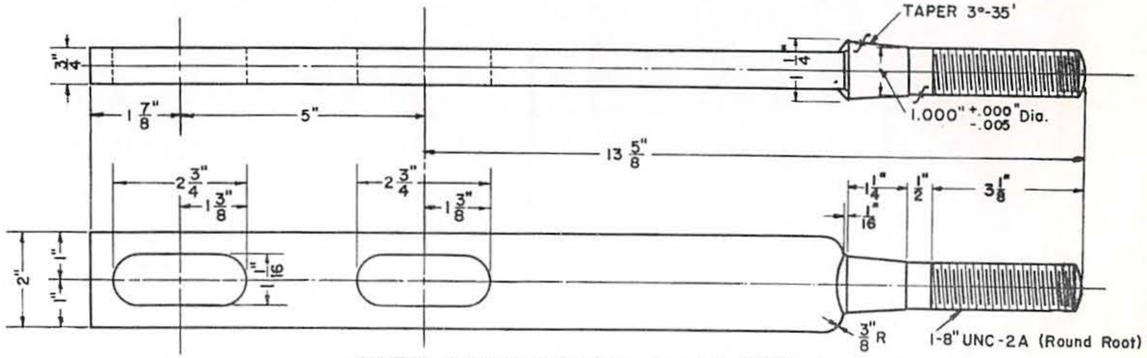
TIE STRAP-("B"=22")("A"=2'-5-1/2") - 1531-5
TIE STRAP-("B"=20")("A"=2'-3-1/2") - 1531-8
O.H. STEEL


13/16" DIA.
3"
6"
11 3/4"
2°
1 1/2"
1 1/2"
3"
3/4"

STOP PLATE - 15316


1"-8 No. 29 NE-168 ELASTIC STOP NUT
STEEL WASHER
12559
S-364
20 1/2"
1/8"

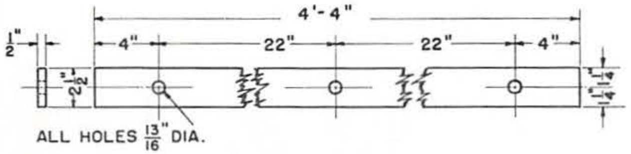
SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY - 1532


TAPER 3°-35'
3/4"
1 1/4"
1.000" +.000 -.005 Dia.
1 7/8"
5"
13 5/8"
2 3/4"
1 3/8"
2 3/4"
1 3/8"
1 1/4"
1/2"
3 1/8"
1/16"
2"
1"
1 1/16"
3/8" R
1-8" UNC-2A (Round Root)

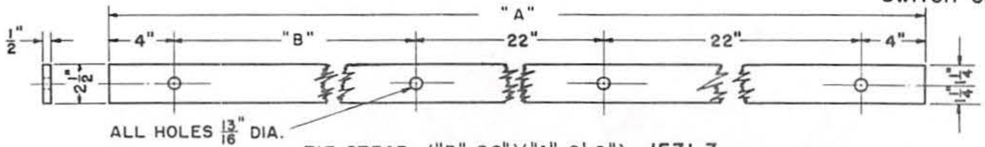
SWITCH CIRCUIT CONTROLLER LUG - 1532-1

APPROVED: J. C. Caywood
Chief Engineer

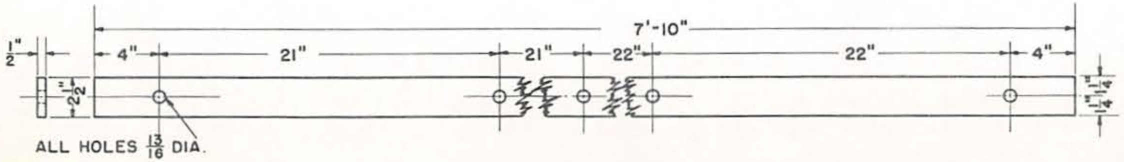
APPROVED: A. L. Jordan
Signal Engineer


4'-4"
1/2"
4"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16" DIA.

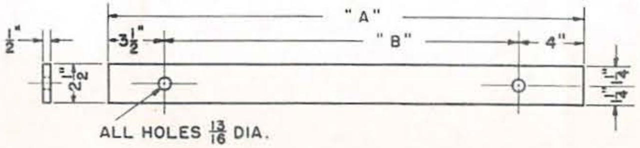
TIE STRAP - 1531-1
O.H. STEEL


"A"
1/2"
4"
"B"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16" DIA.

TIE STRAP - ("B"=22")("A"=6'-2") - 1531-3
TIE STRAP - ("B"=19")("A"=5'-11") - 1531-6
O.H. STEEL


7'-10"
1/2"
4"
21"
21"
22"
22"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16 DIA.

TIE STRAP - 1531-2
O.H. STEEL


"A"
1/2"
3 1/2"
"B"
4"
2 1/2"
1 1/4"
ALL HOLES 13/16 DIA.

TIE STRAP - ("B"=22")("A"=2'-5-1/2") - 1531-4
TIE STRAP - ("B"=19")("A"=2'-2-1/2") - 1531-7
O.H. STEEL

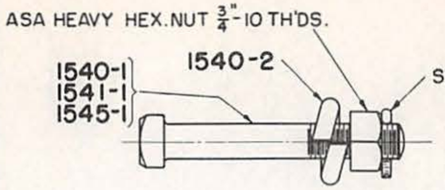
1-8-48: Made & Corrected.
3-25-49: Guide 1533 added.
8-29-50: Stop Plate 15316 added.
12-20-51: Revised account 13/16" hole dimension added to 1533.
2-26-57: Tie Straps 1531-6 & 1531-7 added.
12-4-58: 1532 rev.
7-3-63: Tie Strap 1531-8 added & 1532 revised to AREA Specs.

BALTIMORE & OHIO RAILROAD
SWITCH FITTINGS
Office of Signal Engineer
Baltimore, Md.
July 3, 1963

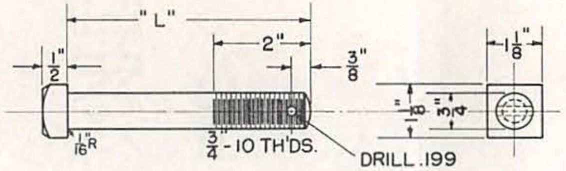
SHEET NO. 1

S-153-K

FRONT FOOT BOLTS SHALL BE MILD O.H. STEEL MEETING THE REQUIREMENTS FOR MACHINE BOLTS, UNFINISHED SQUARE HEAD WITH FILLETS UNDER HEAD AND THREADS CONFORMING TO ASA STANDARD B-18.2-1941.



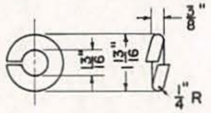
ASA HEAVY HEX. NUT $\frac{3}{4}$"-10 TH'DS.
1540-2
STD. COTTER $\frac{3}{16}$" X 2"
1540-1
1541-1
1545-1



"L"
2"
$\frac{1}{2}$"
$\frac{3}{8}$"
$1\frac{1}{8}$"
$1\frac{1}{8}$"
$\frac{3}{4}$"
$\frac{1}{16}$"R
$\frac{3}{4}$"-10 TH'DS.
DRILL .199

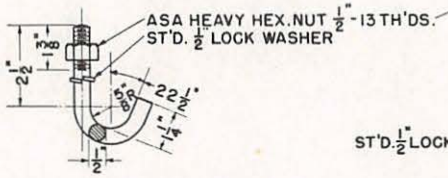
4" LONG FRONT FOOT BOLT ASSEMBLY - **1545**
$4\frac{1}{4}$" LONG FRONT FOOT BOLT ASSEMBLY - **1540**
5" LONG FRONT FOOT BOLT ASSEMBLY - **1541**

"L" = 4" FRONT FOOT BOLT - **1545-1**
"L" = $4\frac{1}{4}$" FRONT FOOT BOLT - **1540-1**
"L" = 5" FRONT FOOT BOLT - **1541-1**



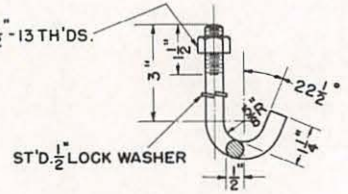
$\frac{3}{8}$"
$1\frac{3}{16}$"
$1\frac{13}{16}$"
$\frac{1}{4}$"R

$\frac{3}{4}$" LOCK WASHER - **1540-2**



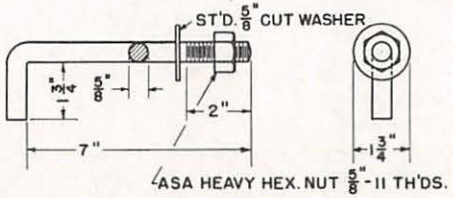
ASA HEAVY HEX. NUT $\frac{1}{2}$"-13 TH'DS.
ST'D. $\frac{1}{2}$ LOCK WASHER
$1\frac{3}{8}$"
$2\frac{1}{2}$"
$\frac{5}{8}$"R
$22\frac{1}{2}$°
$1\frac{1}{4}$"
$\frac{1}{2}$"

HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - **1542**



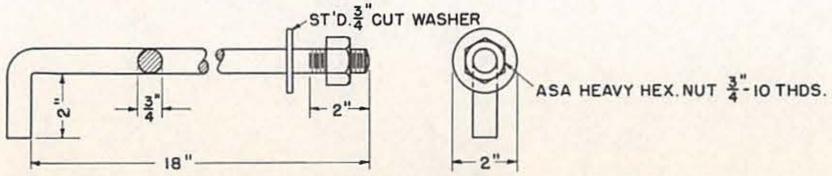
$1\frac{1}{2}$"
3"
$\frac{5}{8}$"R
$22\frac{1}{2}$°
$1\frac{1}{4}$"
ST'D. $\frac{1}{2}$" LOCK WASHER
$\frac{1}{2}$"

HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - **1546**



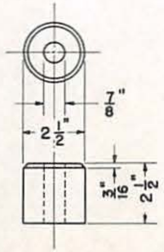
ST'D. $\frac{5}{8}$" CUT WASHER
$1\frac{3}{4}$"
$\frac{5}{8}$"
2"
7"
$1\frac{3}{4}$"
ASA HEAVY HEX. NUT $\frac{5}{8}$"-11 TH'DS.

HOOK BOLT FOR PIPE CARRIER SUPPORT ASSEMBLY - **1543**



ST'D. $\frac{3}{4}$" CUT WASHER
ASA HEAVY HEX. NUT $\frac{3}{4}$"-10 THDS.
2"
$\frac{3}{4}$"
2"
18"
2"

FOUNDATION ANCHOR BOLT ASSEMBLY - **1544**
SAE 1020 STEEL-GALVANIZED OR CADMIUM PLATED AFTER THREADS HAVE BEEN CUT



$\frac{7}{8}$"
$2\frac{1}{2}$"
$\frac{3}{16}$"
$2\frac{1}{2}$"

CAST IRON WASHER - **1548**
PATTERN NO. S5101

APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

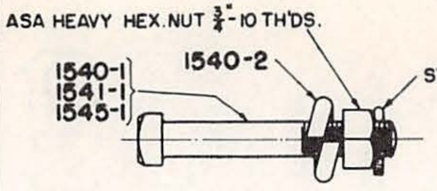
BALTIMORE & OHIO RAILROAD
NUTS & BOLTS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 2, 1948

S-154-A

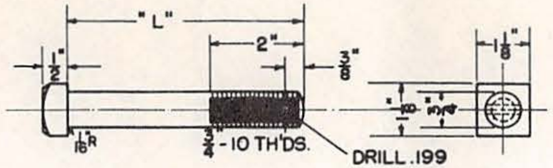
ADOPTED: 12-10-47.
REVISED: ADDITIONAL FRONT FOOT BOLT SHOWN.
REVISED 4-12-49, HOOK BOLT 1548 CHANGED TO 1546.

RECEIVED
MAY 23 1949
SPECIFICATION DEPT.

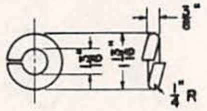
FRONT FOOT BOLTS SHALL BE MILD O.H. STEEL MEETING THE REQUIREMENTS FOR MACHINE BOLTS, UNFINISHED SQUARE HEAD WITH FILLETS UNDER HEAD AND THREADS CONFORMING TO ASA STANDARD B-18.2-1941.


ASA HEAVY HEX. NUT 3/4"-10 TH'DS.
1540-2
STD. COTTER 3/16" X 2"
1540-1
1541-1
1545-1

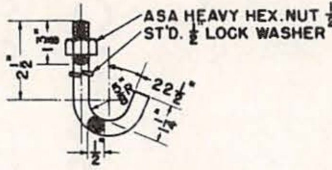
4" LONG FRONT FOOT BOLT ASSEMBLY - 1545
4 1/4" LONG FRONT FOOT BOLT ASSEMBLY - 1540
5" LONG FRONT FOOT BOLT ASSEMBLY - 1541


"L"
2"
3/8"
1 1/8"
3/4"-10 TH'DS.
DRILL .199

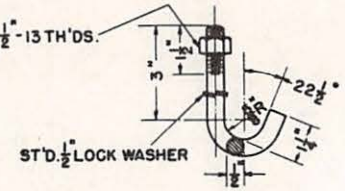
"L" = 4" FRONT FOOT BOLT - 1545-1
"L" = 4 1/4" FRONT FOOT BOLT - 1540-1
"L" = 5" FRONT FOOT BOLT - 1541-1



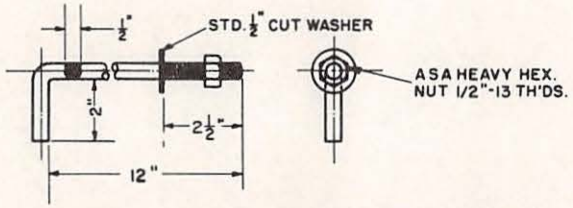
3/4" LOCK WASHER - 1540-2


ASA HEAVY HEX. NUT 1/2"-13 TH'DS.
ST'D. 1/2" LOCK WASHER
2 1/2"
22 1/2°
1/2"

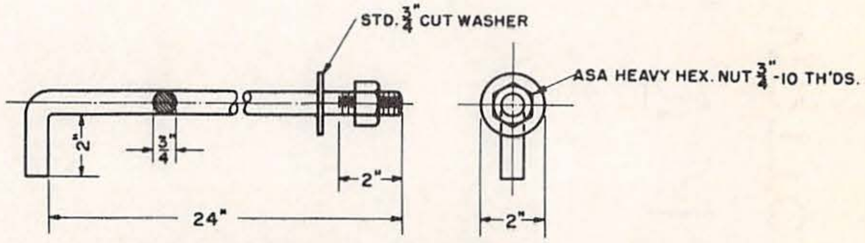
HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - 1542


3"
22 1/2°
ST'D. 1/2" LOCK WASHER
1/2"

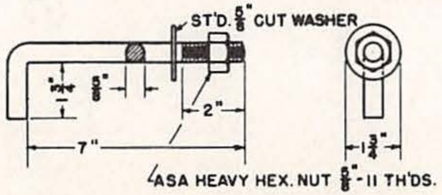
HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - 1546


1/2"
STD. 1/2" CUT WASHER
ASA HEAVY HEX. NUT 1/2"-13 TH'DS.
2"
2 1/2"
12"

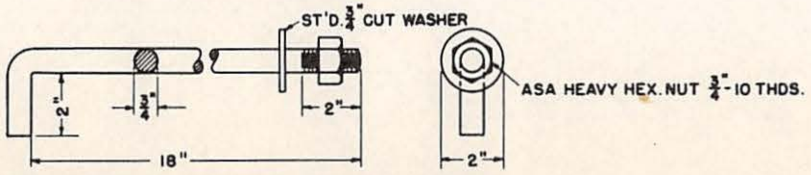
FOUNDATION ANCHOR BOLT ASSEMBLY - 1549
SAE 1020 STEEL-GALVANIZED OR CADMIUM PLATED AFTER THREADS HAVE BEEN CUT


STD. 3/4" CUT WASHER
ASA HEAVY HEX. NUT 3/4"-10 TH'DS.
2"
3/4"
2"
24"
2"

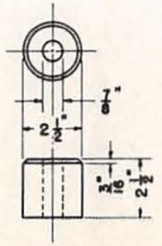
BUNGALOW ANCHOR BOLT ASSEMBLY - 15421
SAE 1020 STEEL


ST'D. 5/8" CUT WASHER
5/8"
2"
7"
1 3/4"
ASA HEAVY HEX. NUT 5/8"-11 TH'DS.

HOOK BOLT FOR PIPE CARRIER SUPPORT ASSEMBLY - 1543


ST'D. 3/4" CUT WASHER
ASA HEAVY HEX. NUT 3/4"-10 THDS.
2"
3/4"
2"
18"
2"

FOUNDATION ANCHOR BOLT ASSEMBLY - 1544
SAE 1020 STEEL-GALVANIZED OR CADMIUM PLATED AFTER THREADS HAVE BEEN CUT



CAST IRON WASHER - 1548
PATTERN NO. S5101

APPROVED: ______ CHIEF ENG'R. MAINTENANCE

APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

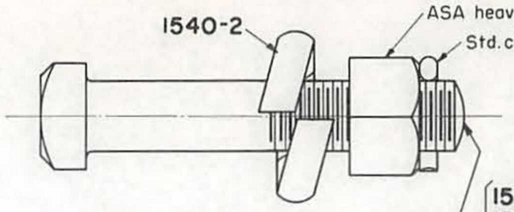
BALTIMORE & OHIO RAILROAD
NUTS & BOLTS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 2, 1948

S-154-B

ADOPTED: 12-10-47
REVISED: ADDITIONAL FRONT FO BOLT SHOWN.
REVISED: 4-12-49, HOOK BOLT 1548 CHANGED TO 1546.
Revised: 8-9-50, Foundation bolt 1549 and 15421 added.

3-3-52: New plan made.
7-13-53: No.15426 added.
4-5-56 Shoulder Eyebolt No.15425 changed to No.15427.

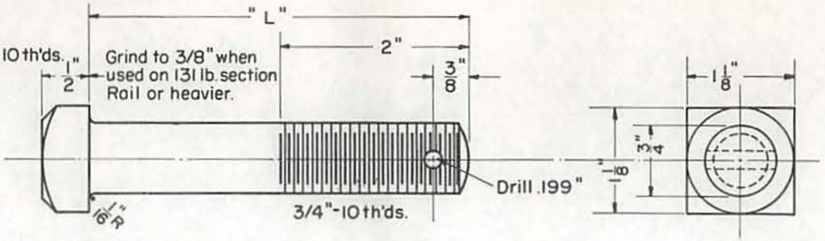
NOTE: Front Foot Bolts shall be mild O.H. Steel meeting the requirements for machine bolts, unfinished square head with fillets under head and threads conforming to A.S.A. Standard B-18.2-1941.



1540-2
ASA heavy hex. nut 3/4"-10 th'ds.
Std. cotter 3/16"x2"

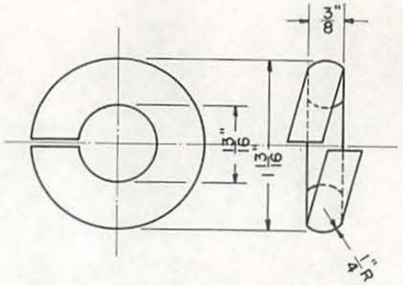
1540-1
1541-1
1545-1
15422
15423

4" LONG FRONT FOOT BOLT ASSEMBLY - **1545**
4-1/4" LONG FRONT FOOT BOLT ASSEMBLY - **1540**
4-3/4" LONG FRONT FOOT BOLT ASSEMBLY - **15425**
5" LONG FRONT FOOT BOLT ASSEMBLY - **1541**
5-1/2" LONG FRONT FOOT BOLT ASSEMBLY - **15424**



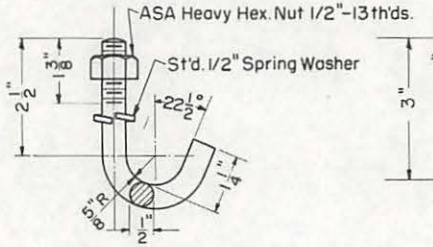
"L"
2"
1/2"
Grind to 3/8" when used on 131 lb. section Rail or heavier.
3/8"
Drill .199"
3/4"-10 th'ds.
1/16" R
1 1/8"
3/4"
1 1/8"

"L" = 4" FRONT FOOT BOLT - **1545-1**
"L" = 4-1/4" FRONT FOOT BOLT - **1540-1**
"L" = 4-3/4" FRONT FOOT BOLT - **15423**
"L" = 5" FRONT FOOT BOLT - **1541-1**
"L" = 5-1/2" FRONT FOOT BOLT - **15422**



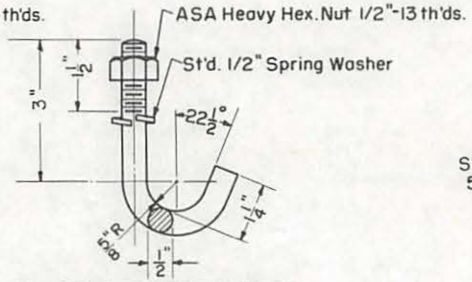
3/8"
13/16"
1 3/16"
1/4" R

3/4" SPRING WASHER - **1540-2**



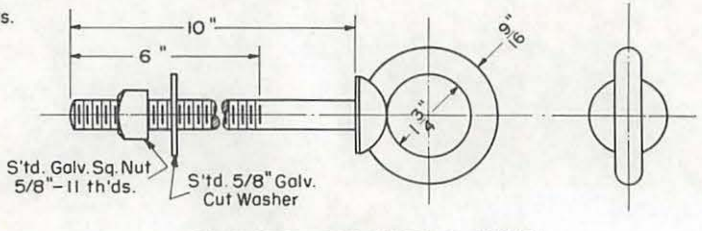
ASA Heavy Hex. Nut 1/2"-13 th'ds.
St'd. 1/2" Spring Washer
3/8"
2 1/2"
22 1/2°
1 1/4"
5/8" R
1/2"

HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - **1542**



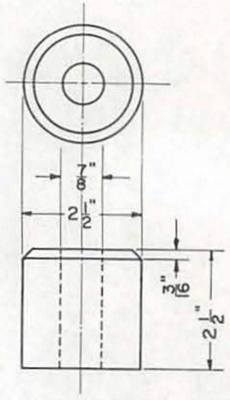
ASA Heavy Hex. Nut 1/2"-13 th'ds.
St'd. 1/2" Spring Washer
1 1/2"
3"
22 1/2°
1 1/4"
5/8" R
1/2"

HOOK BOLT FOR PIPE CARRIER SIDE ASSEMBLY - **1546**



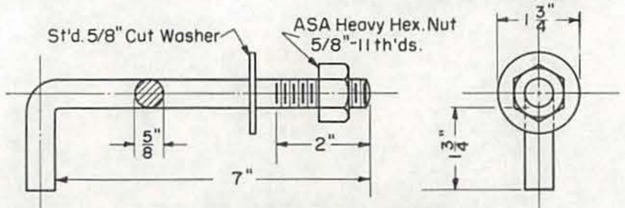
10"
6"
9/16"
1 3/4"
S'td. Galv. Sq. Nut 5/8"-11 th'ds.
S'td. 5/8" Galv. Cut Washer

GALV. SHOULDER EYEBOLT - **15427**
Hubbard No. 4960



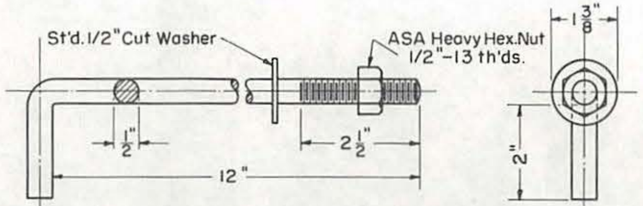
7/8"
2 1/2"
3/16"
2 1/2"

CAST IRON WASHER - **1548**
Pattern No. S5101



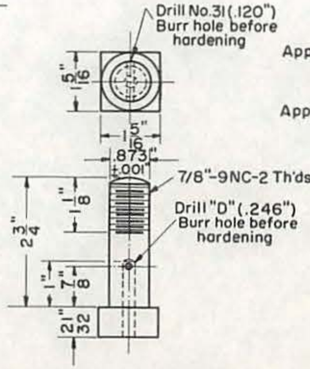
St'd. 5/8" Cut Washer
ASA Heavy Hex. Nut 5/8"-11 th'ds.
1 3/4"
5/8"
2"
7"
1 3/4"

HOOK BOLT FOR PIPE CARRIER SUPPORT ASSEMBLY - **1543**



St'd. 1/2" Cut Washer
ASA Heavy Hex. Nut 1/2"-13 th'ds.
1 3/8"
1/2"
2 1/2"
12"
2"

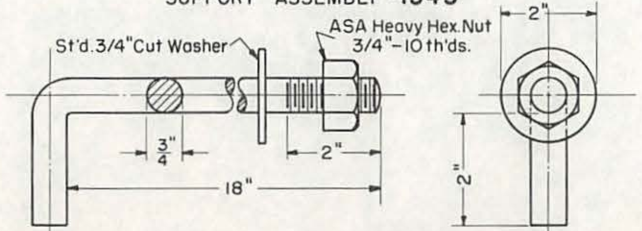
FOUNDATION ANCHOR BOLT ASSEMBLY - **1549**
C-1020 Steel-Galvanized or Cadmium Plated after threads have been cut.



Drill No.31 (.120") Burr hole before hardening
5/16"
1 5/16"
.873" ±.001"
7/8"-9NC-2 Th'ds.
1 1/8"
2 3/4"
Drill "D" (.246") Burr hole before hardening
1"
7/8"
21/32"

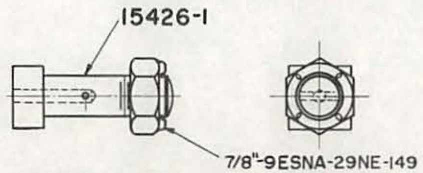
Approved: C. Riley
Chief Engineer Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer



St'd. 3/4" Cut Washer
ASA Heavy Hex. Nut 3/4"-10 th'ds.
2"
3/4"
2"
18"
2"

FOUNDATION ANCHOR BOLT ASSEMBLY - **1544**
C-1020 Steel-Galvanized or Cadmium Plated after threads have been cut.



15426-1
7/8"-9ESNA-29NE-149

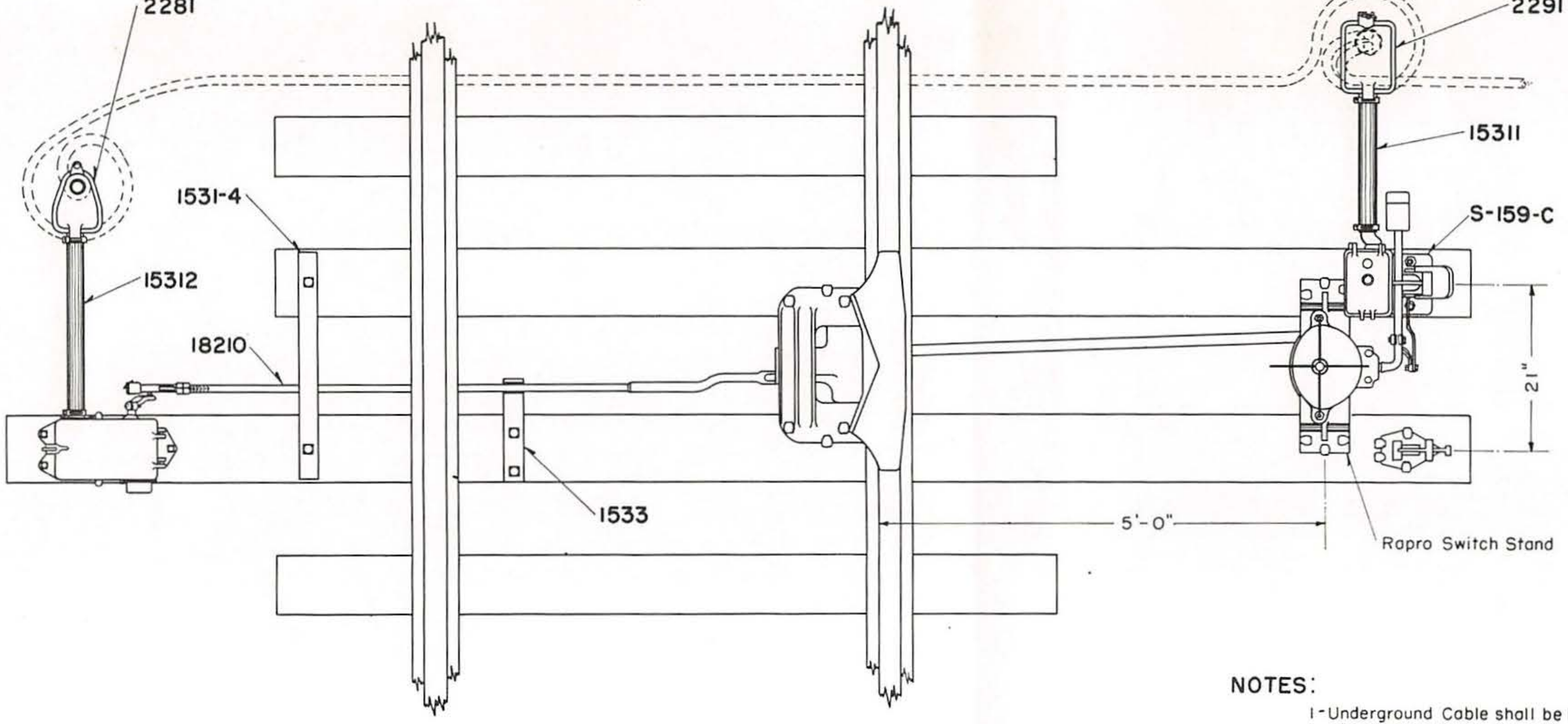
TURNED BOLT ASSEMBLY - **15426**
For Operating Rod on Switch Machines

TURNED BOLT - **15426-1**
C-1118 Steel - Heat Treat similar to G.R.S. 38186-17.

BALTIMORE & OHIO RAILROAD
NUTS & BOLTS
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

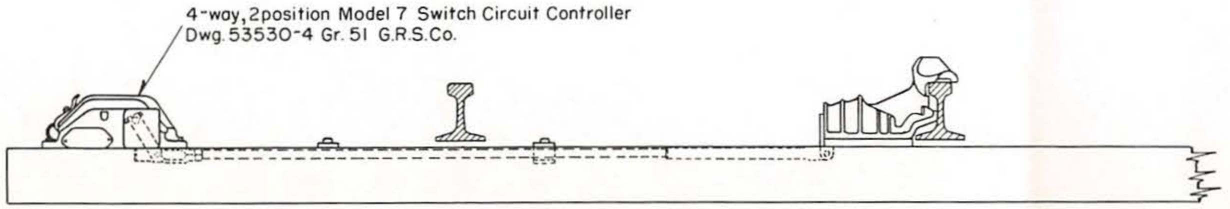
Sheet No. 1

S-154-F


2281
2291
15311
S-159-C
1531-4
15312
18210
21"
1533
5'-0"
Rapro Switch Stand

NOTES:

1-Underground Cable shall be installed in accordance with Current Instruction I-131.


4-way, 2position Model 7 Switch Circuit Controller
Dwg. 53530-4 Gr. 51 G.R.S.Co.

Approved: C.R.Riley
Chief Engineer

Approved: A L Jordan
Signal Engineer

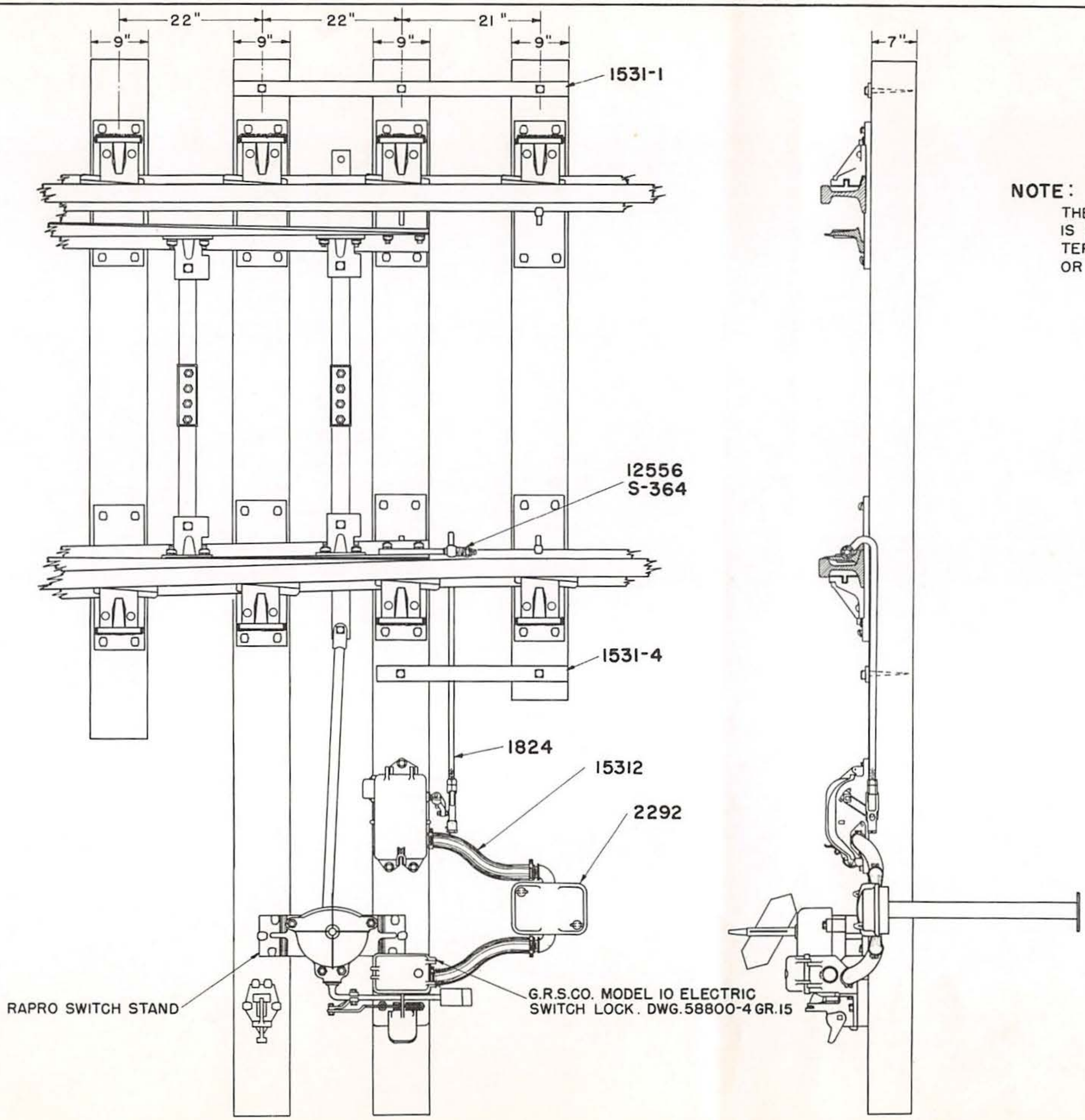
BALTIMORE & OHIO RAILROAD

HAND THROW DERAIL LAYOUT WITH ELECTRIC LOCK

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

2-23-51: New Plan Made.
9-8-53: Jct. Box Ref. Changed.
1-13-59: Revised.

S-158-B


22"
22"
21"
9"
9"
9"
9"
7"
1531-1
12556
S-364
1531-4
1824
15312
2292
RAPRO SWITCH STAND
G.R.S.CO. MODEL 10 ELECTRIC SWITCH LOCK. DWG.58800-4 GR.15

NOTE:

THE ARRANGEMENT AS SHOWN SHALL BE USED WHERE ELECTRIC LOCK IS REQUIRED FOR HAND THROW TRAILING SWITCH IN MULTIPLE TRACK TERRITORY SIGNALED IN ONE DIRECTION ONLY, HAND THROW DERAIL, OR SWITCH IN NON SIGNALED TRACK.

Approved: A Riley
Chief Engineer

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

HAND THROW SWITCH LAYOUT WITH ELECTRIC LOCK

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

10-31-47: New Plan Made.
3-30-49: Adopted.
8-29-50: Air Hose Made 1-7/8" I.D.
11-18-52: Raco Jct. Box 139-8 Changed to G.R.S. 16 Way Jct. Box.
1-13-59: Rev.

Sheet No. 1

S-159-C

INSTALLATION SHOULD BE MADE IN ACCORDANCE WITH STANDARD PLAN S-159-C, sh. 1.

1 - The throw-over lever of the switch stand shall have a minimum dimension of 18" from the centerline of switch stand to the inner face of the weight.

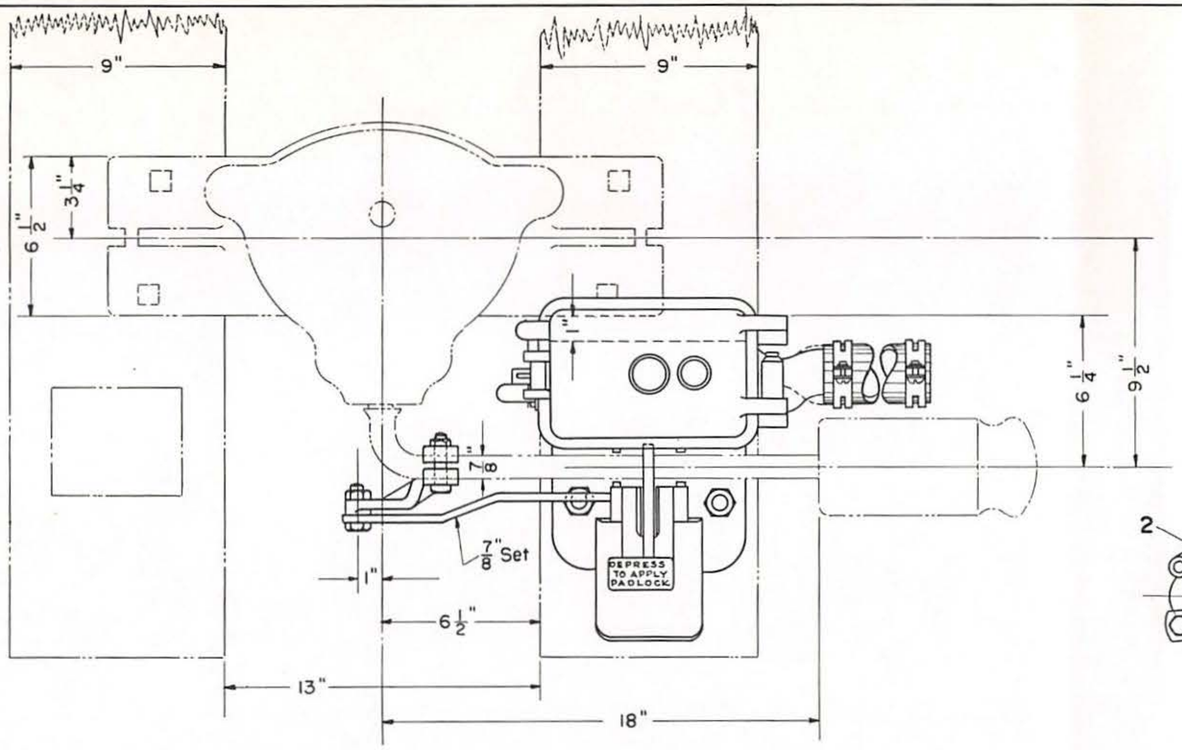
2 - Support (Ref. 2) should be fitted to the switch lever so that when bolted on it will lay parallel to lever.

3 - After fitting, drill thru lever & support with 3/8" dia. drill & assemble rivet (Ref. 4) as shown.

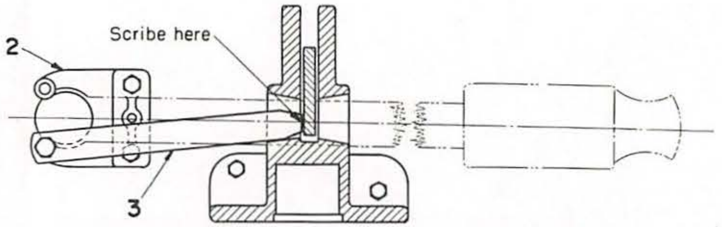
4 - Secure the lock on shim block (No. 1590) on tie with bolts, washers, nuts & lock washers as shown.

5 - To assemble latch rod (Ref. 3), place the switch lever in the locked up position as shown on this plan. Depress the foot pedal and insert the latch rod thru the rectangular hole in the lock stand, insert stud bolt thru pivot hole in latch rod temporarily, depress latch as far as it will go, hold the latch in this position and scribe across the face of the latch rod in line with the pedal casting. Remove the latch rod and cut off the end 1/32" short of the scribe mark, then cut corners of latch rod as shown (Ref. 3).

6 - In the final assembly of latch rod (Ref. 3) fasten rod support (Ref. 2) with bolt, slotted nut & cotter pin supplied with support (Ref. 2).

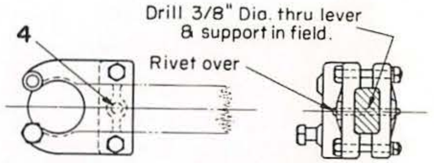


9"
9"
3¼"
6½"
1"
6¼"
9½"
7/8
7/8" Set
1"
6½"
13"
18"
DEPRESS TO APPLY PADLOCK



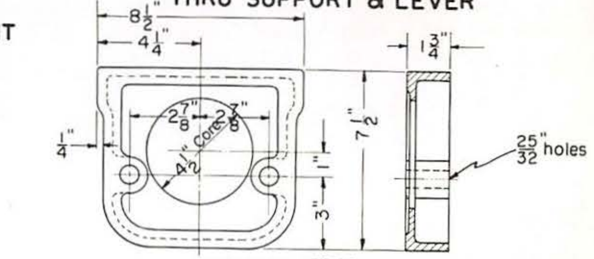
2
Scribe here
3

SECTION SHOWING LATCH ROD ARRANGEMENT



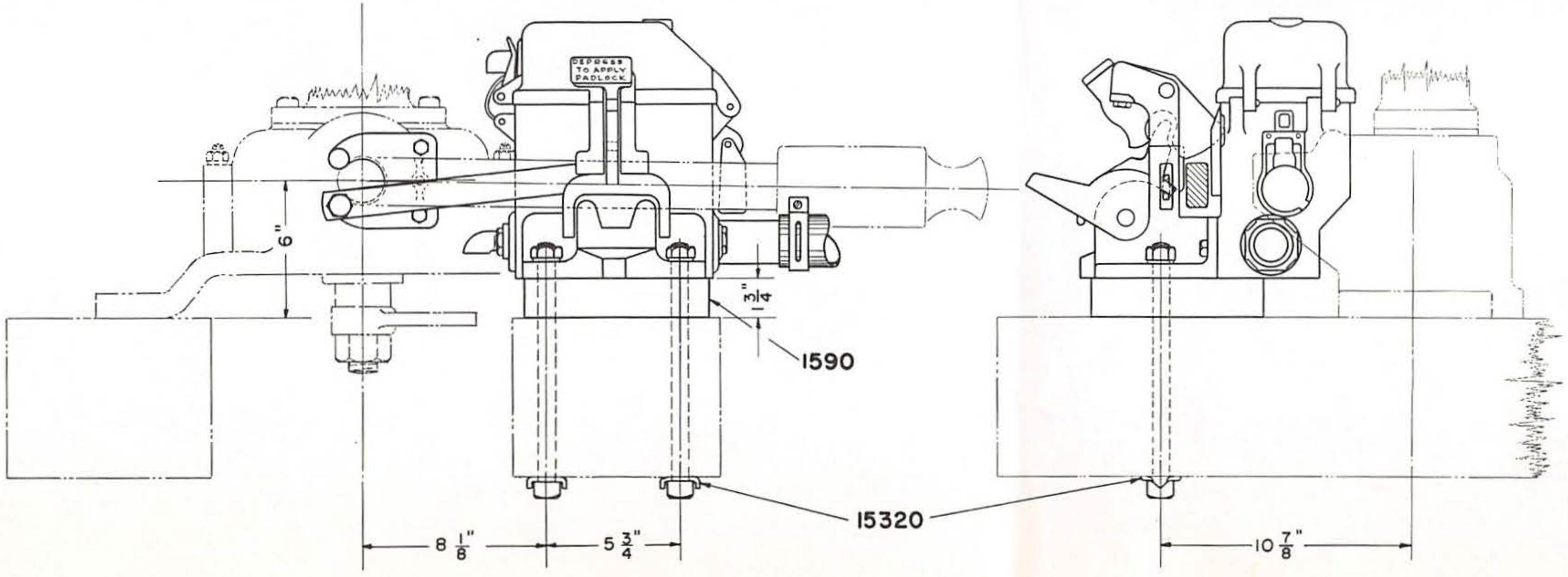
4
Drill 3/8" Dia. thru lever & support in field.
Rivet over

SKETCH SHOWING RIVET THRU SUPPORT & LEVER



8½"
4¼"
1¾"
2 7/8"
2 7/8"
4½" Core
¼"
1"
3"
7½"
25/32" holes

SUBBASE-1590
Material: Cast-Iron
G.R.S. No. 59559



DEPRESS TO APPLY PADLOCK
6"
¾
1590
15320
8⅛"
5¾"
10⅞"

Approved: C Riley
Chief Engineer

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

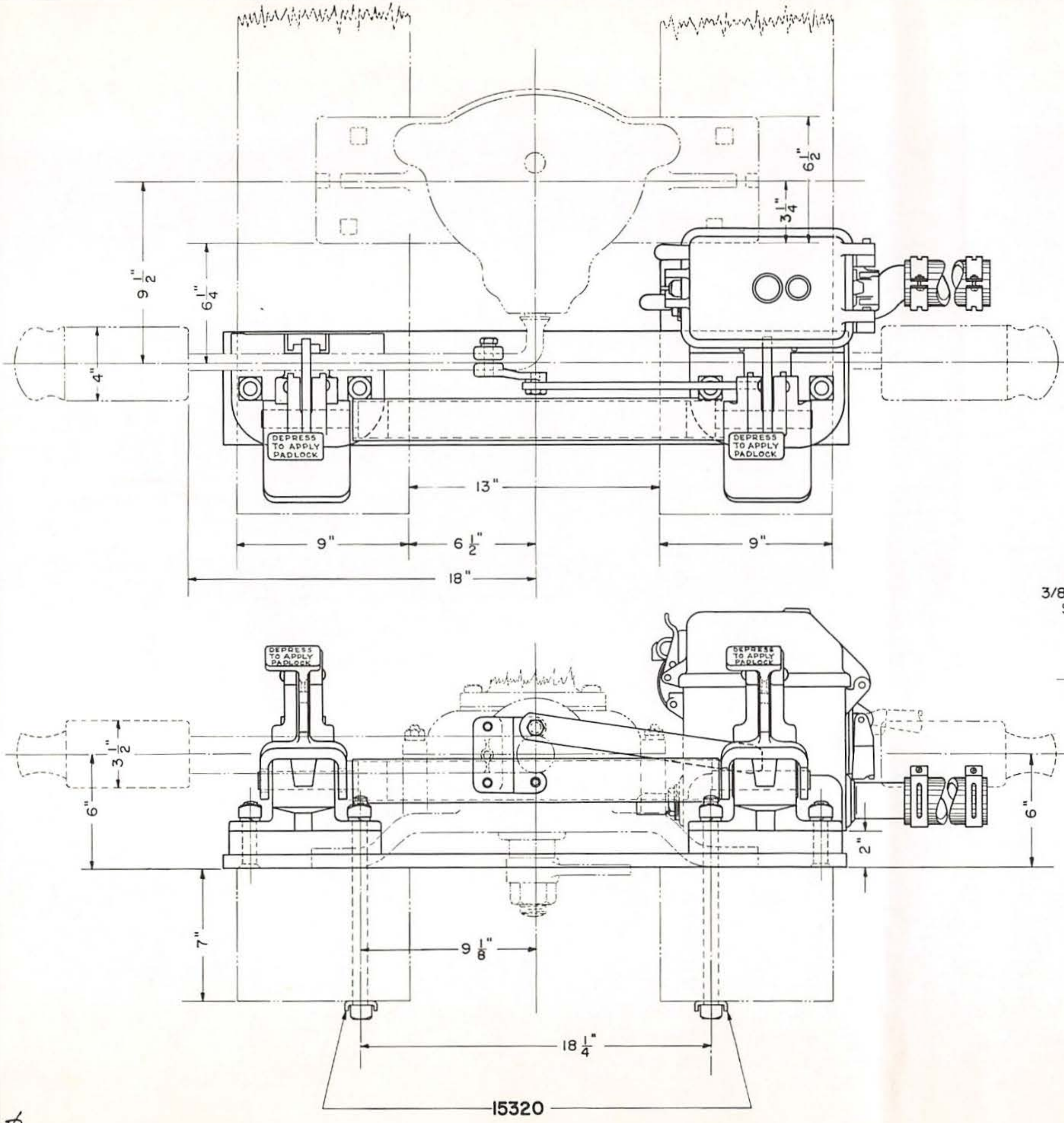
APPLICATION OF MODEL 10 ELECTRIC SW. LOCK TO RAPRO SWITCH STAND

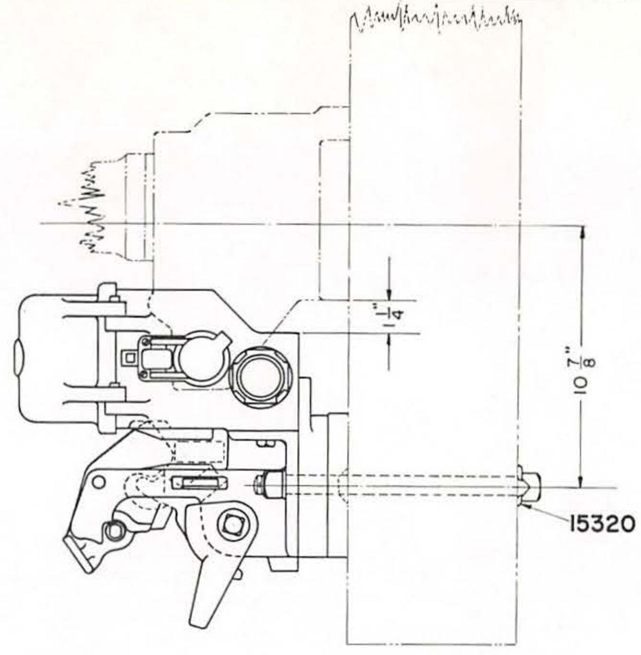
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

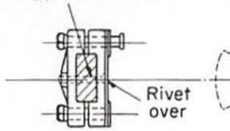
Sheet No. 2

S-159-C

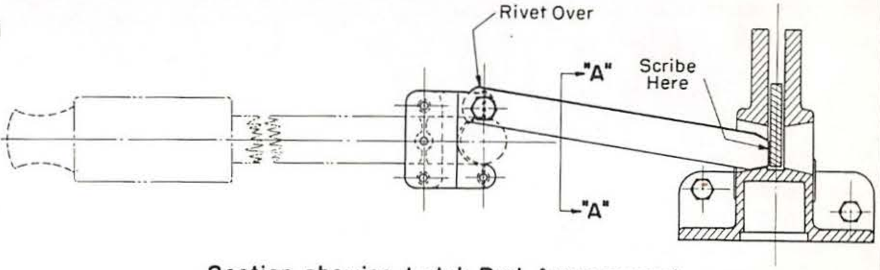
3-30-49: Adopted.
11-18-52: New Plan made account sub 1590 changed.
1-13-59: Cast Iron Washer C-12398 changed to No. 15320 - Standard Plan S-153-H sh. 3.


6 1/2"
3 1/4"
9 1/2"
6 1/4"
4"
DEPRESS TO APPLY PADLOCK
DEPRESS TO APPLY PADLOCK
13"
9"
6 1/2"
9"
18"
DEPRESS TO APPLY PADLOCK
DEPRESS TO APPLY PADLOCK
3 1/2"
6"
2"
6"
7"
9 1/8"
18 1/4"
15320


1 1/4"
10 7/8"
15320


3/8" Drill thru Lever and Support in Field
Rivet over

SECTION "A-A"


Rivet Over
"A"
Scribe Here
"A"

Section showing Latch Rod Arrangement

Approved: C. L. Riley
Chief Engineer

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

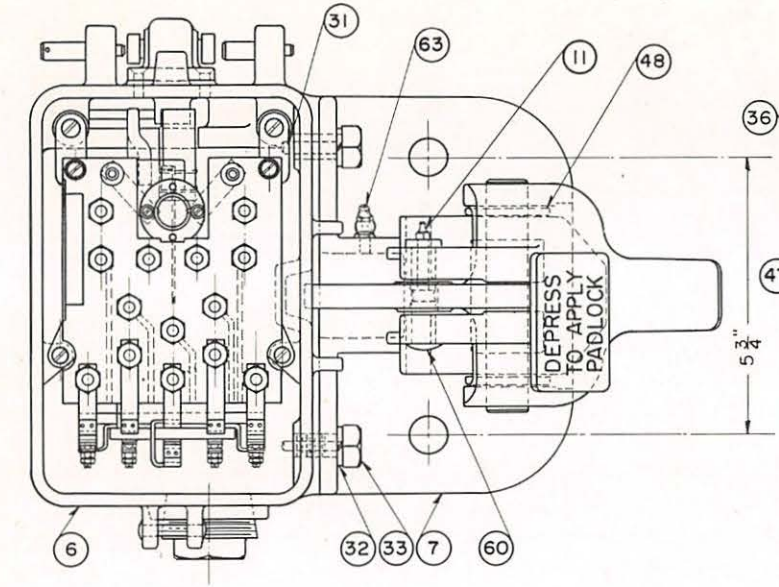
TANDEM ARRANGEMENT OF MODEL 10 ELECTRIC SWITCH LOCK APPLIED TO RAPRO SWITCH STAND

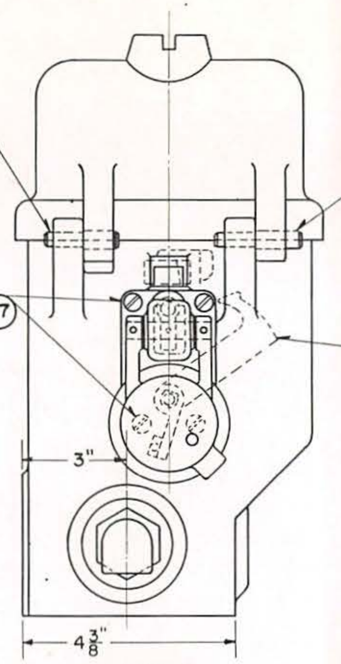
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 3

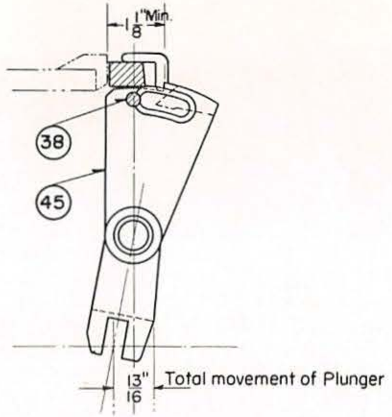
S-159-C

5-23-52: New Plan Made.
11-18-52: Adopted.
1-13-59: Cast Iron Washer C-12398 changed to No. 15320-Standard Plan S-153-H sh. 3.


31
63
11
48
DEPRESS TO APPLY PADLOCK
5 3/4"
6
32
33
7
60

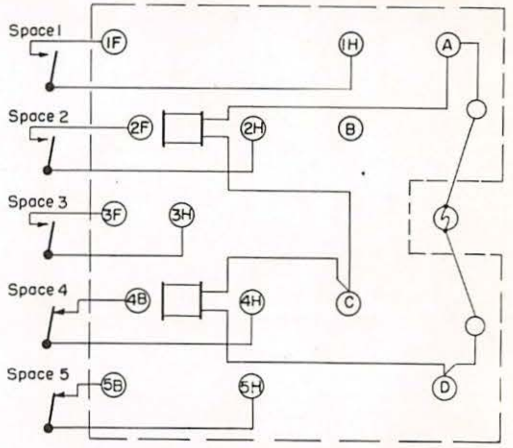

36
35
47
44
3"
4 3/8"

END VIEW


1 1/8" Min.
38
45
13/16"
Total movement of Plunger

Section showing Operating Cam

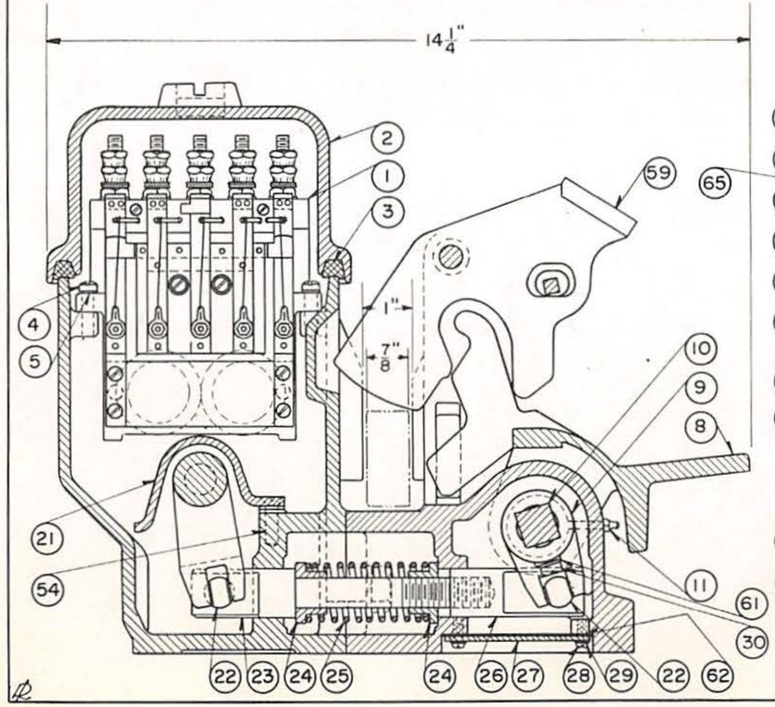
CONNECTIONS SHALL BE AS SHOWN
UNLESS OTHERWISE SPECIFIED

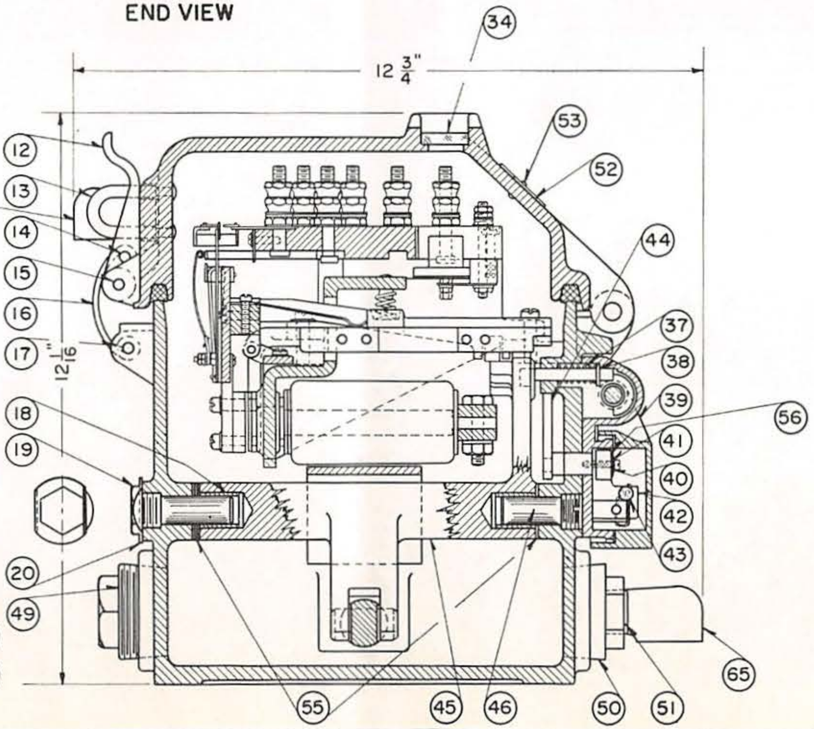

Space 1
1F
1H
A
Space 2
2F
2H
B
Space 3
3F
3H
Space 4
4B
4H
C
Space 5
5B
5H
D

(Connection Diagram 58447-4 G.R.S.Co.)

Note:

Contacts in spaces 1 & 5 are actuated by energization of the lock magnet coils.
Contacts in spaces 2, 3 & 4 are actuated by removal of padlock.


14 1/4"
2
1
3
59
65
4
5
1"
7/8"
10
9
8
21
54
11
61
30
22
23
24
25
24
26
27
28
29
22
62


12 3/4"
34
53
52
12
13
14
15
16
17
12 1/16"
44
37
38
39
56
41
40
42
43
18
19
20
49
65
55
45
46
50
51

Approved: C. Riley
Chief Engineer

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
DETAILS OF MODEL 10 ELECTRIC SWITCH LOCK
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

7-30-53: New Plan Made.
1-12-54: Adopted.
1-13-59: Revised.

Sheet No. 4

S-159-C

MATERIAL LIST FOR MODEL 10 ELECTRIC SWITCH LOCK

Item	Req'd.	Name	G.R.S. Drawing No.
1	1	Mechanism Complete.	58801-1, Gr.2
2	1	Cover.	58814-2.
3	As Req'd.	Gasket 5/16" Sq. Flax.	43460-6
4	4	Screw 1/4"-20 x 1" lg. Fill. Hd.	45572-14
5	4	Washer 1/4" Shakeproof.	53029-2
6	1	Case.	58813-4
7	1	Stand.	58815-3
8	1	Pedal.	58816-6
9	1	Crank.	58824-1
10	1	Shaft.	58837-1
11	3	Oiler 3/16" Drive.	34232-31
12	1	Hasp.	16110-9
13	1	Staple.	16914-4
14	1	Pin 1/4" x 1-1/4".	737
15	1	Pin 1/4" x 2-3/16".	6969
16	1	Strap.	30804-18
17	1	Pin 1/4" x 1-3/8".	7828
18	2	Bushing, Oilite.	6714-149
19	1	Trunnion	35269-18
20	1	Washer	626-103
21	1	Guard	58992
22	2	Pin	58976
23	1	Plunger	58825-1
24	2	Bushing	739-10
25	1	Spring	786-275
26	1	Tang	58977
27	1	Plate	35845-135
28	4	Screw No. 10-32 x 1/2" Fill. Hd.	12280-9
29	4	Washer No. 10 Shakeproof.	53029-7
30	1	Screw 5/16"-24 x 7/8" lg. Fill. Hd.	38272-2
31	2	Pin, Taper No. 6 x 1-1/4".	715-55
32	2	Washer 1/2" Lock	091-1
33	2	Screw 1/2"-13 x 1" lg. Hex. Hd.	0606-1
34	1	Glass.	924-24
35	1	Stud.	441-171
36	1	Stud.	441-170
37	1	Spring.	786-277
38	1	Plunger.	58821-4
39	1	Cover Complete (Emergency Release).	58985 Gr. 1
40	1	Screw No. 8-32 x 7/16" lg. Fill. Hd.	55160-11
41	1	Washer No. 8 Shakeproof.	53029-4
42	1	Handle Complete.	58991 Gr. 1
43	1	Car Seal.	35285
44	1	Cam Complete (Emergency Release).	58990 Gr. 1
45	1	Cam, Operating.	58984
46	1	Trunnion.	35269-17
47	4	Screw No. 10-32 x 5/8" Flat Hd.	6727-10
48	2	Bushing.	8942-86
49	1	Pipe Plug 1-1/2".	36174-1
50	1	Reducing Bushing 1-1/2" to 1/2".	41892-9
51	2	Tin Plug 1/2".	56164
52	1	Name Plate.	401-608
53	2	Pin, Escutcheon No. 18 x 1/2".	42384
54	2	Screw 1/4"-20 x 3/4" Flat Hd.	45609-2
55	As Req'd	Washer, Shim.	1225-180
56	1	Washer, .165" to 1/2" x .035" th.	975-1
57			
58			
59	1	Latch	54581-6
60	1	Pin 1/2" x 2-1/8" Flat Hd. (1020 Steel).	730-112
61	1	Washer, Lock 5/16" Type "HC".	0623-5
62	1	Gasket.	13014-297
63	1	Oiler, 30°, 3/16" Drive.	34232-69
64			
65	2	Ventilator	52981-3
66			
67			
68			
69			

7-20-53-New Plan Made.
1-12-54: Adopted.
1-13-59: Revised.

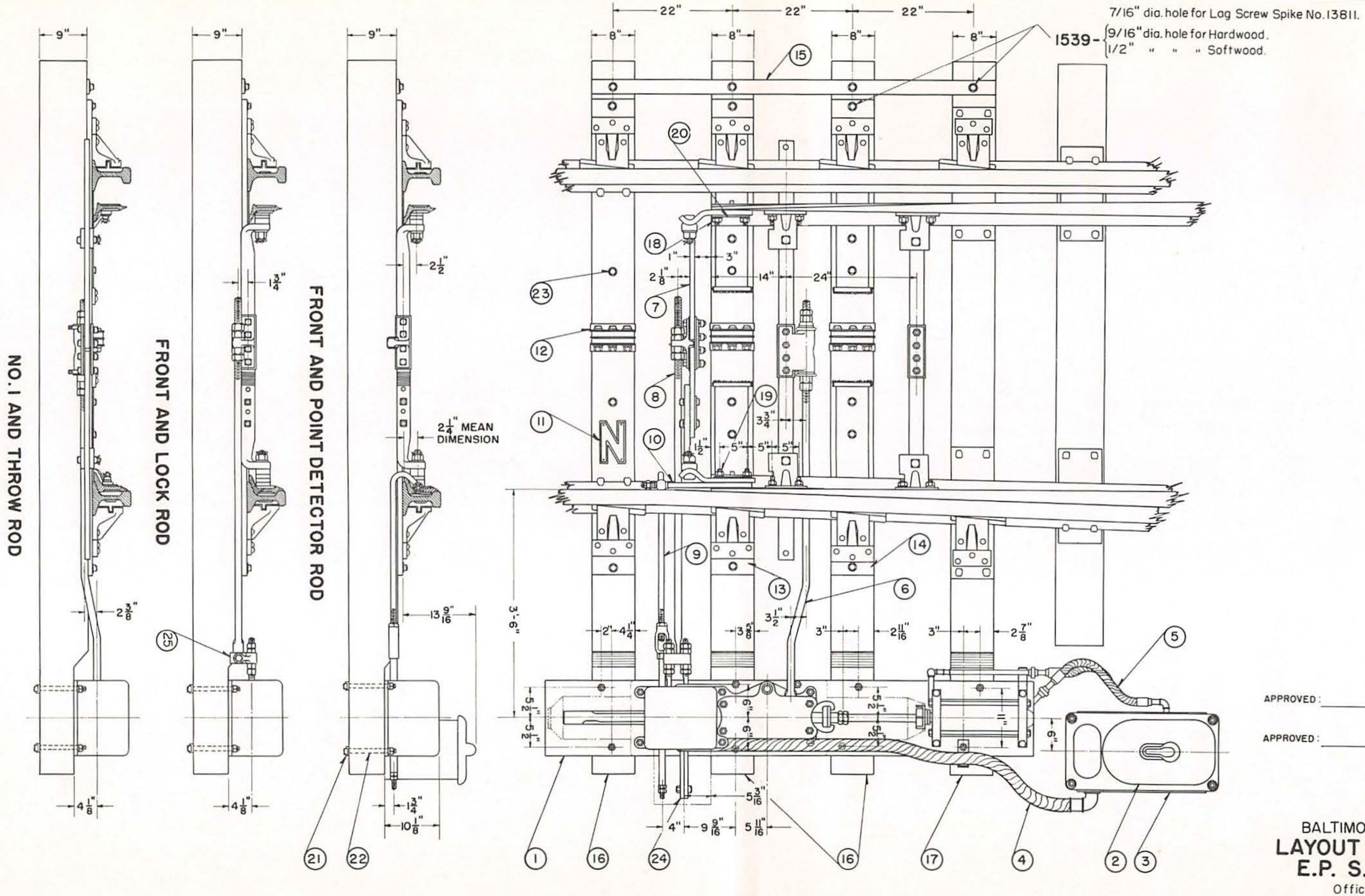
Approved: Chief Engineer

Approved: A L Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
**MATERIAL LIST FOR MODEL 10
ELECTRIC SWITCH LOCK**
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 5

S-159-C


7/16" dia. hole for Lag Screw Spike No.13811.
1539- 9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
22"
22"
22"
8"
9"
NO.1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
$1\frac{3}{4}$"
$2\frac{1}{2}$"
$2\frac{1}{4}$" MEAN DIMENSION
$2\frac{3}{8}$"
$13\frac{9}{16}$"
$4\frac{1}{8}$"
$1\frac{3}{4}$"
$10\frac{1}{8}$"
1"
3"
$2\frac{1}{8}$"
14"
24"
$3\frac{3}{4}$"
$1\frac{1}{2}$"
5"
N
3'-6"
2"
$4\frac{1}{4}$"
$3\frac{5}{8}$"
$3\frac{1}{2}$"
3"
$2\frac{11}{16}$"
$2\frac{7}{8}$"
$5\frac{1}{2}$"
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$5\frac{3}{16}$"
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APPROVED: Chief Engineer

APPROVED: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR STYLE "A5"
E.P. S.& L. MOVEMENT

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

4-26-48: New Plan Made.
Ref. U.S.& S. Co. Dwg. No. C9381 Sh.
1-11-50: Gage Plate Assembly Changed.
3-26-54: Lag Screw 13811 changed to Drive Spike 1539.
5-17-55: Item 21 Changed.
1-13-59: 1532 rev.

Sheet No. 1

S-160-E

MATERIAL REQUIRED FOR SWITCH LAYOUT USING STYLE "A5" E.P.S& L. MOVEMENT

ITEM	NUMBER	REQ'D.	NAME	DRAWING
			RIGHT HAND LAYOUT	
1	185221	1	RIGHT HAND "A5" E.P.S.& L. MOVEMENT COMPLETE - U.S.& S.CO.	C9405, sh.2
2	109898	1	130 OHM C.P. SWITCH VALVE COMPLETE	D2394, sh.6
3	161412	1	C.I. FOUNDATION FOR C.P. SWITCH VALVE	C9296, sh.1
4		1	1 1/2" FLEX. STEEL CONDUIT 6'-8" LONG	
5	181824	2	ARMORED HOSE CONNECTIONS	B9046, sh.4
6	1845	1	OPERATING ROD ASSEMBLY	S-184-D, sh.2
7	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163-C
8	1835	1	LOCK ROD CONNECTING ROD	S-183-D, sh.1
9	1826	1	POINT DETECTOR CONNECTING ROD ASSEMBLY	S-182-B, sh.1
10	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153-H, sh.1
11		1	LETTER "N"	31760-62
12		1	NO. 1 INSULATED GAUGE PLATE ASSEMBLY (Shown on Pg. 207 Roadway & Track Standard Plan)	37020
13		1	NO. 2 " " " " " " " " " " " " "	37020
14		1	NO. 3 " " " " " " " " " " " " "	37020
15	1531-3	1	2 1/2" X 1/2" X 6'-2" LONG TIE STRAP	S-153-H, sh.1
16	1521	3	8" X 9" X 11'-0" LONG SAWED OAK SWITCH TIES	S-152-B
17	1523	1	8" X 9" X 11'-0" " " " " TIE	S-152-B
18	1540	2	3/4" DIA. X 4 1/4" LONG FRONT FOOT BOLT ASSEMBLY	S-154-F, sh.1
19	1541	2	3/4" DIA. X 5" " " " " "	S-154-F, sh.1
20	125512	2	SWITCH LUG PLATES	S-364
21	15320	8	RACO BOLT GRIP FOR 3/4" DIA. BOLT. (RACO NO. 589-1)	S-153-H, sh.3
22		8	3/4" DIA. X 9" LONG SQ. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS.	
23	1539	20	GALVANIZED DRIVE SPIKE	S-153-H, sh.2
24	18335	1	ADJUSTABLE LOCK ROD ASSEMBLY	S-183-D, sh.5
25	18341	1	LOCK ROD LUG ASSEMBLY	S-183-D, sh.6
			LEFT HAND LAYOUT	
1A	185602	1	LEFT HAND "A5" E.P.S.& L. MOVEMENT COMPLETE - U.S.& S.CO.	C9405, sh.2
6A	1845-L	1	OPERATING ROD ASSEMBLY (OPPOSITE HAND TO ITEM 6)	
24A	18336	1	ADJUSTABLE LOCK ROD ASSEMBLY	S-183-D, sh.5

NOTE:

WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT AND SECTION OF RAIL. CHIEF ENGINEER'S DRAWING NO. 37020.

APPROVED: ______________
Chief Engineer

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

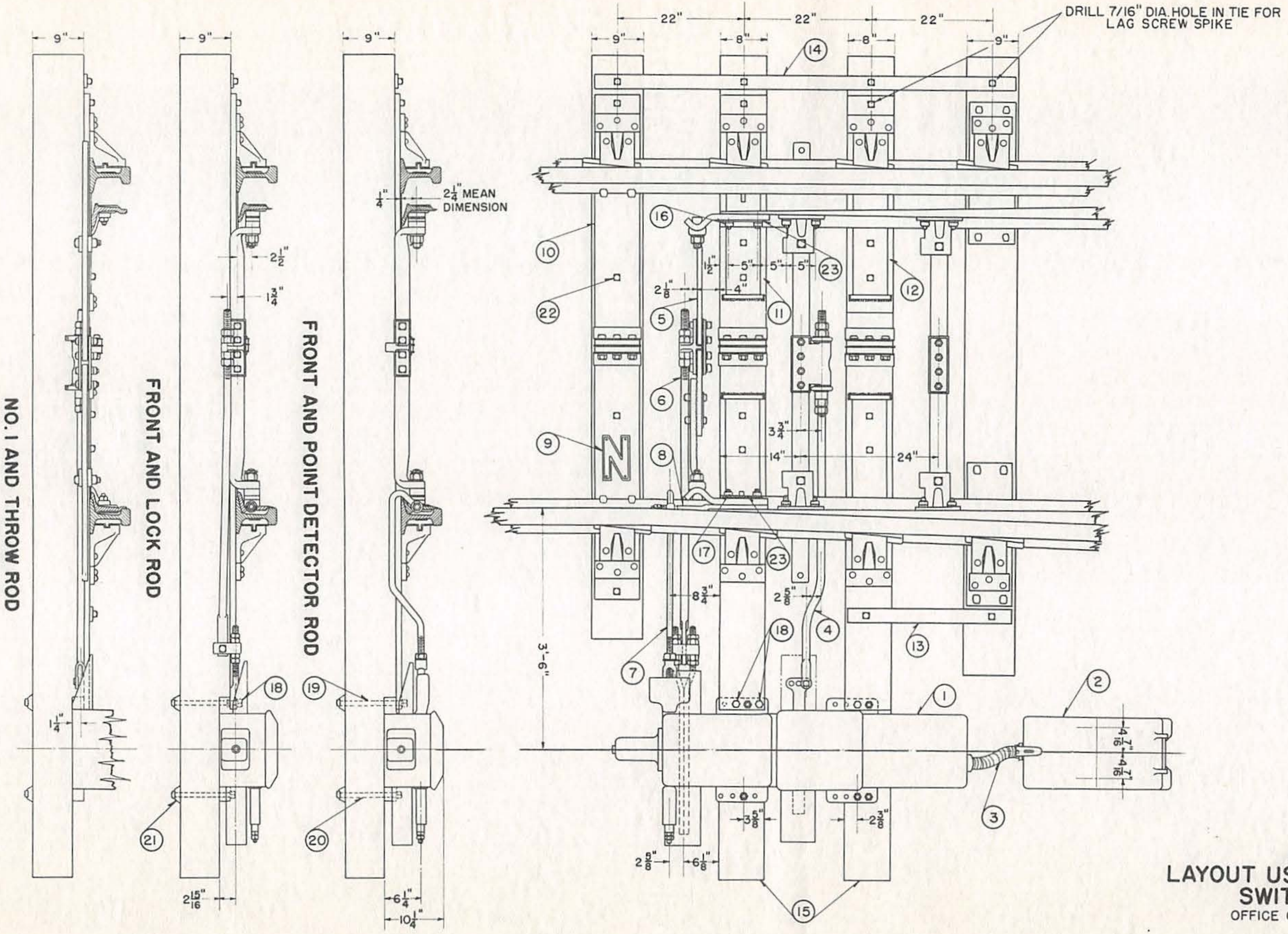
MATERIAL LIST FOR STYLE "A5" E.P.S.& L. MOVEMENT

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

6-1-48: New Plan Made.
9-9-53: Sheet Numbers Changed.
5-9-56: Revised.
1-13-59: 1532 rev.

Sheet No. 2

S-160-E


NO.1 AND THROW ROD
FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
DRILL 7/16" DIA. HOLE IN TIE FOR LAG SCREW SPIKE
2¼" MEAN DIMENSION
9"
22"
8"
5"
4"
1½"
2⅛"
2½"
1¾"
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¼"
3¾"
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2 15/16"
6¼"
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REFERENCE - U.S.&S.CO. PLAN C9195 SHT.112
Revised: 1-18-50 account Gauge Plate Assembly changed.
Revised: 4-2-52.

APPROVED: O.B. Harvey
CHIEF ENG'R. MAINTENANCE

APPROVED: A.S. Hunt
CHIEF ENG'R. COMM.& SIGS.

BALTIMORE & OHIO RAILROAD

LAYOUT USING STYLE "M2" OR "M22" A&B SWITCH AND LOCK MOVEMENT

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MAY 1, 1948

SHEET NO. 1

S-161-B

MATERIAL REQUIRED FOR SWITCH LAYOUT USING STYLE "M2", "M22A" OR "M22B"

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	SWITCH MACHINE (SEE NOTE)	
2		1	RELAY HOUSING & JUNCTION BOX	C16726 SH.4
3			1 1/2" FLEX. STEEL CONDUIT	
4	1843	1	OPERATING ROD ASSEMBLY	S-184 SH.1
5	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163
6	1836	1	LOCK ROD CONNECTING ROD	S-183 SH.1
7	1828	1	POINT DETECTOR ROD ASSEMBLY	S-182 SH.1
8	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153 - SH.1
9		1	LETTER "N"	31760-62
10		1	NO.1 INSULATED GAUGE PLATE ASSEMBLY	37019
11		1	NO.2 " " " "	37019
12		1	NO.3 " " " "	37019
13	1531-4	1	2 1/2" X 1/2" X 2'-5 1/2" LONG TIE STRAP	S-153 - SH.1
14	1531-3	1	2 1/2" X 1/2" X 6'-2" LONG TIE STRAP	S-153 - SH.1
15	1520	2	8" X 9" X 12'-0" LONG SAWED OAK SWITCH TIES	S-152 - SH.1
16	1540	2	3/4" DIA. X 4 1/4" LONG FRONT FOOT BOLT ASSEMBLY	S-154
17	1541	2	3/4" DIA X 5" " " " " "	S-154
18		3	3/4" DIA. X 3" LONG HEX. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS	
19		2	3/4" DIA. X 12" " " " " " " " " " "	
20		3	3/4" DIA. X 11" " " " " " " " " " "	
21	C-12398	5	CAST-IRON WASHERS	S-76140-A
22	13811	20	GALVANIZED LAG SCREW SPIKE	S-382
23	125512	2	SWITCH LUG PLATE	S-364

NOTE:

FOR STYLE "M2" SWITCH MACHINE SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2815

FOR STYLE "M22A" OR "M22B" SWITCH MACHINES SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2826-1

WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT & SECTION OF RAIL. CHIEF ENGINEER MAINTENANCE DRAWING NO. 37019.

APPROVED: C B Harvey Jr
CHIEF ENG'R. MAINTENANCE

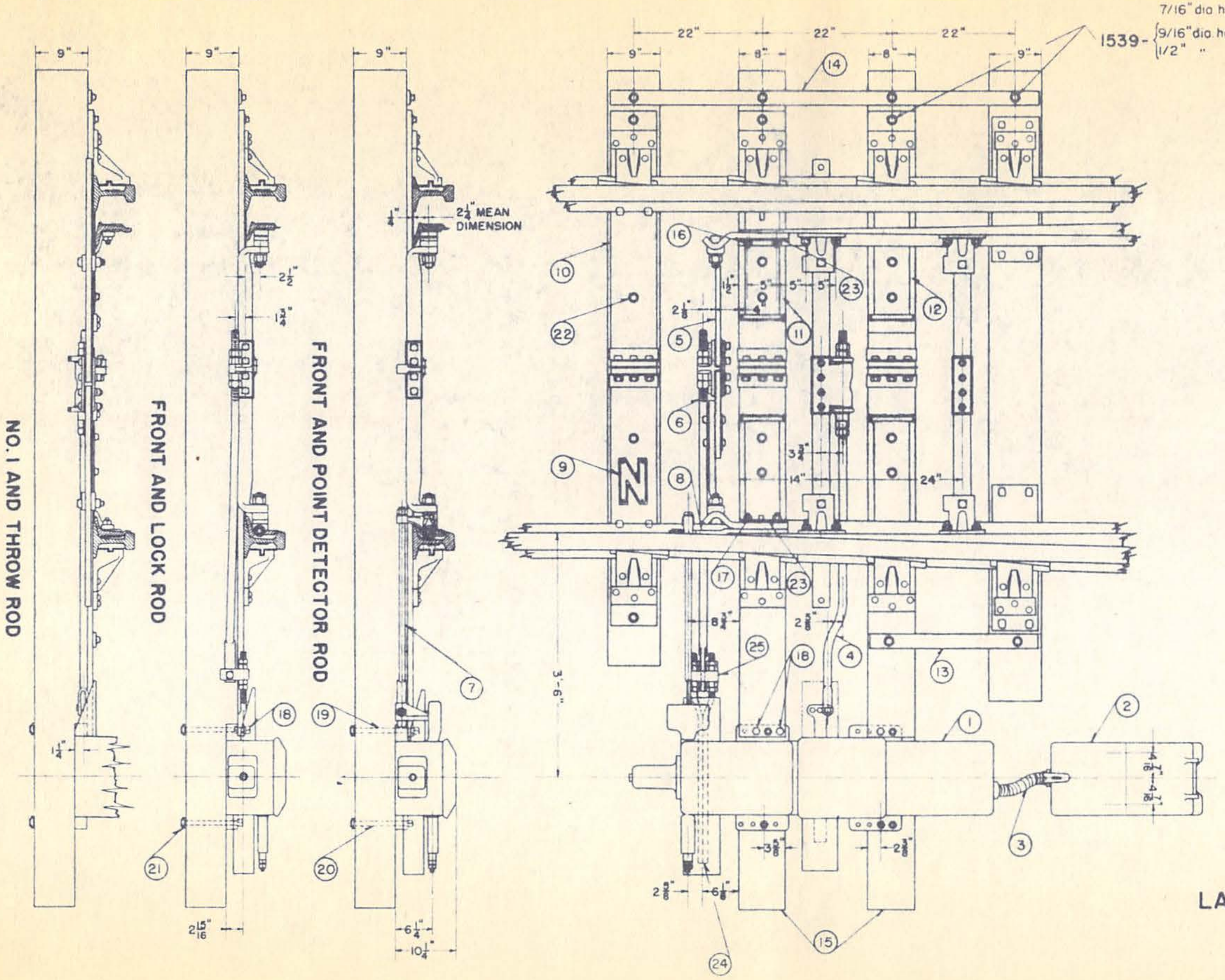
APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

ITEM NO. 23 ADDED 4-2-52

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR STYLE
"M2" OR "M22" A & B S. & L. MOVEMENT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JUNE 4, 1948

SHEET NO. 2 S-161-B

REFERENCE - U S & S CO PLAN C9195 SHT 112
Revised 1-18-50 account Gauge Plate Assembly changed
Revised 4-2-52
Revised 3-26-54 Lag Screw 13811 changed
to Drive Spike 1539.
Revised 5-17-55 account Items 7 & 21 changed.


7/16" dia. hole for Lag Screw Spike No. 13811.
1539 - 9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
22"
22"
22"
9"
8"
8"
9"
$2\frac{1}{4}$" MEAN DIMENSION
$2\frac{1}{2}$"
$1\frac{3}{4}$"
$1\frac{1}{4}$"
$2\frac{15}{16}$"
$6\frac{1}{4}$"
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5"
5"
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$2\frac{1}{8}$"
$3\frac{3}{4}$"
14"
24"
$8\frac{3}{4}$"
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3'-6"
$4\frac{7}{16}$"
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APPROVED A. Riley
Chief Eng'r. Maintenance

APPROVED A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT USING STYLE "M2" OR "M22" A & B SWITCH AND LOCK MOVEMENT

Office of Signal Engineer
Baltimore , Md.
May 1, 1948

SHEET NO. 1

S-161-D

MATERIAL REQUIRED FOR SWITCH LAYOUT USING STYLE "M2", "M22A" OR "M22B"

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	SWITCH MACHINE (SEE NOTE)	
2		1	RELAY HOUSING & JUNCTION BOX	C16726, sh.4
3			1 1/2" FLEX. STEEL CONDUIT	
4	1843	1	OPERATING ROD ASSEMBLY	S-184-B, sh.1
5	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163-B
6	1836	1	LOCK ROD CONNECTING ROD	S-183-C, sh.1
7	1828	1	POINT DETECTOR CONNECTING ROD ASSEMBLY	S-182-B, sh.2
8	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153-F, sh.1
9		1	LETTER "N"	31760-62
10		1	NO.1 INSULATED GAUGE PLATE ASSEMBLY	37019
11		1	NO.2 " " " "	37019
12		1	NO.3 " " " "	37019
13	1531-5	1	2 1/2" X 1/2" X 2'-5 1/2" LONG TIE STRAP	S-153-F, sh.1
14	1531-3	1	2 1/2" X 1/2" X 6'-2" LONG TIE STRAP	S-153-F, sh.1
15	1520	2	8" X 9" X 12'-0" LONG SAWED OAK SWITCH TIES	S-152-A, sh.1
16	1540	2	3/4" DIA. X 4 1/4" LONG FRONT FOOT BOLT ASSEMBLY	S-154-D, sh.1
17	1541	2	3/4" DIA X 5" " " " " "	S-154-D, sh.1
18		3	3/4" DIA. X 3" LONG HEX. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS	
19		2	3/4" DIA. X 12" " " " " " " " " " "	
20		3	3/4" DIA. X 11" " " " " " " " " " "	
21	15320	5	RACO BOLT GRIP FOR 3/4" DIA. BOLT (Raco No. 589-1)	S-153-F. sh.3
22	1539	20	GALVANIZED DRIVE SPIKE	S-153-F, sh.2
23	125512	2	SWITCH LUG PLATE	S-364
24	18342	1	ADJUSTABLE LOCK ROD ASSEMBLY	S-183-C, sh.6
25	18341	1	LOCK ROD LUG ASSEMBLY	S-183-C, sh.6

NOTE:

FOR STYLE "M2" SWITCH MACHINE SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2815

FOR STYLE "M22A" OR "M22B" SWITCH MACHINES SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2826-1

WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT & SECTION OF RAIL. CHIEF ENGINEER MAINTENANCE DRAWING NO. 37019.

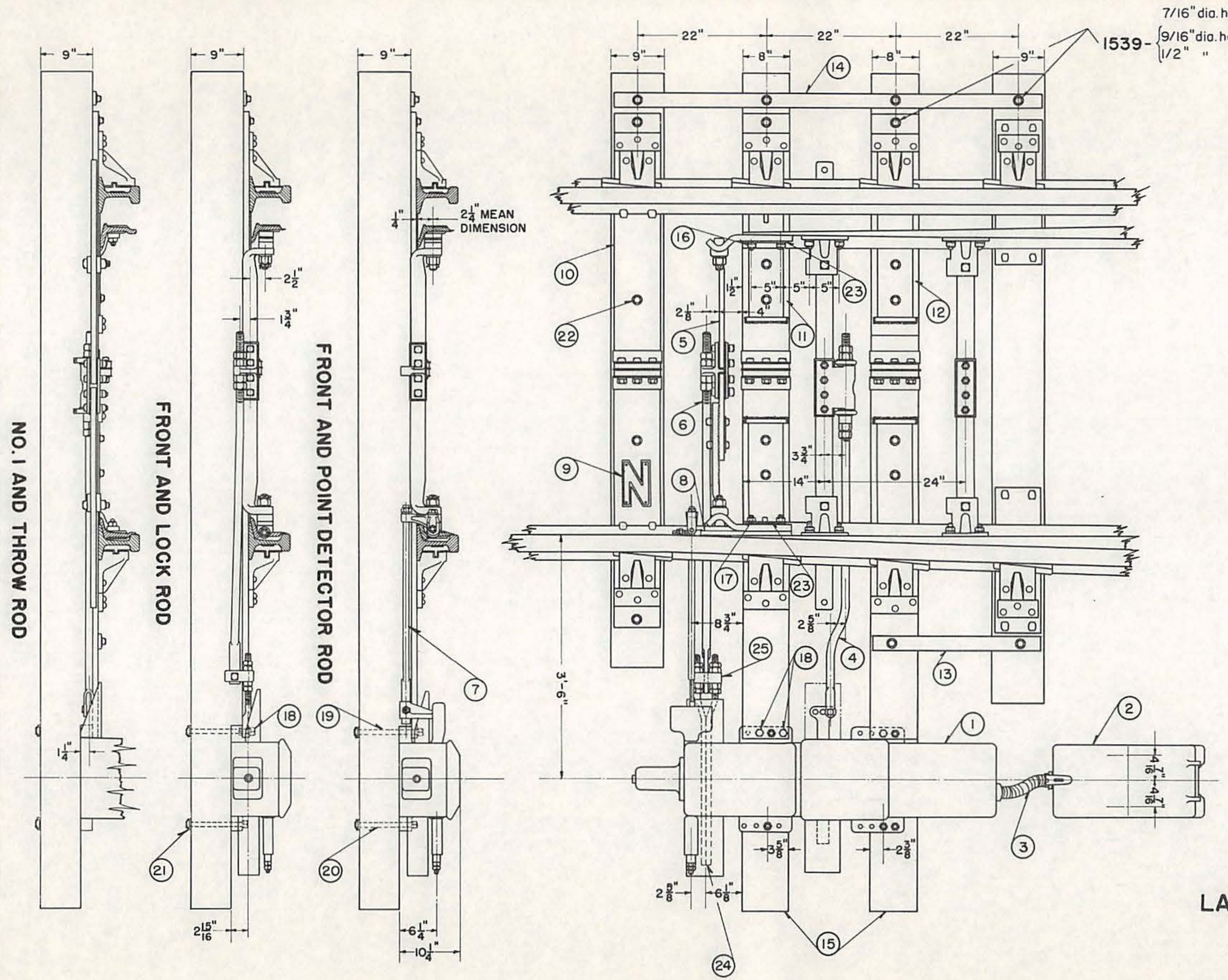
APPROVED ____________
Chief Eng'r Maintenance

APPROVED A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR STYLE "M2" OR "M22"A&B S.& L. MOVEMENT
Office of Signal Engineer
Baltimore, Md.
June 4, 1948

ITEM NO. 23 ADDED 4-2-52
9-9-53:- File Numbers revised.
Revised 5-17-55 account items 7 & 21 changed.

SHEET NO. 2 S-161-D


7/16" dia. hole for Lag Screw Spike No. 13811.
1539- 9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
22"
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2¼" MEAN DIMENSION
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FRONT AND LOCK ROD
FRONT AND POINT DETECTOR ROD
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APPROVED: Chief Engineer
Construction & Maintenance

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT USING STYLE "M2" OR "M22" A&B SWITCH AND LOCK MOVEMENT

Office of Signal Engineer
Baltimore , Md.
Jan. 13 , 1959

SHEET NO. 1

S-161-F

Made & Corrected: 5-1-48.
Reference: U.S.& S. Co. Plan C9195 Sh. 112.
1-18-50 Gauge Plate Assembly changed
4-2-52: Revised.
3-26-54: Lag Screw 13811 Changed to
Drive Spike 1539.
5-17-55: Items 7 & 21 changed.
1-13-59: 1532 & 1532-1 rev.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING STYLE "M2", "M22A" OR "M22B"

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	SWITCH MACHINE (SEE NOTE)	
2		1	RELAY HOUSING & JUNCTION BOX	C16726,sh.4
3			1 1/2" FLEX. STEEL CONDUIT	
4	1843	1	OPERATING ROD ASSEMBLY	S-184-D,sh.1
5	1630	1	SWIVEL FRONT ROD ASSEMBLY	S-163-C
6	1836	1	LOCK ROD CONNECTING ROD	S-183-D,sh.1
7	1828	1	POINT DETECTOR CONNECTING ROD ASSEMBLY	S-182-B,sh.2
8	1532	1	SWITCH CIRCUIT CONTROLLER LUG ASSEMBLY	S-153-H,sh.1
9		1	LETTER "N"	31760-62
10		1	NO. 1 INSULATED GAUGE PLATE ASSEMBLY (Shown on Pg. 206 Roadway & Track Standard Book)	37019
11		1	NO. 2 " " " " " " " " " " "	37019
12		1	NO. 3 " " " " " " " " " " "	37019
13	1531-5	1	2 1/2" X 1/2" X 2'-5 1/2" LONG TIE STRAP	S-153-H,sh.1
14	1531-3	1	2 1/2" X 1/2" X 6'-2" LONG TIE STRAP	S-153-H,sh.1
15	1520	2	8" X 9" X 12'-0" LONG SAWED OAK SWITCH TIES	S-152-B,sh.1
16	1540	2	3/4" DIA. X 4 1/4" LONG FRONT FOOT BOLT ASSEMBLY	S-154-F,sh.1
17	1541	2	3/4" DIA X 5" " " " " "	S-154-F,sh.1
18		3	3/4" DIA. X 3" LONG HEX. HD. HEX. NUT MACHINE BOLTS WITH SPRING WASHERS	
19		2	3/4" DIA. X 12" " " " " " " " " " "	
20		3	3/4" DIA. X 11" " " " " " " " " " "	
21	15320	5	RACO BOLT GRIP FOR 3/4" DIA. BOLT (Raco No. 589-1)	S-153-H.sh.3
22	1539	20	GALVANIZED DRIVE SPIKE	S-153-H,sh.2
23	125512	2	SWITCH LUG PLATE	S-364
24	18342	1	ADJUSTABLE LOCK ROD ASSEMBLY	S-183-D,sh.6
25	18341	1	LOCK ROD LUG ASSEMBLY	S-183-D,sh.6

NOTE:

FOR STYLE "M2" SWITCH MACHINE SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2815

FOR STYLE "M22A" OR "M22B" SWITCH MACHINES SEE U.S.&S.CO. CATALOGUE SECTION C, PLATE C-2826-1

WHEN ORDERING INSULATED GAUGE PLATES SPECIFY WEIGHT & SECTION OF RAIL. CHIEF ENGINEER CONSTRUCTION & MAINTENANCE DRAWING NO. 37019.

APPROVED: ARiley
Chief Engineer
Construction & Maintenance

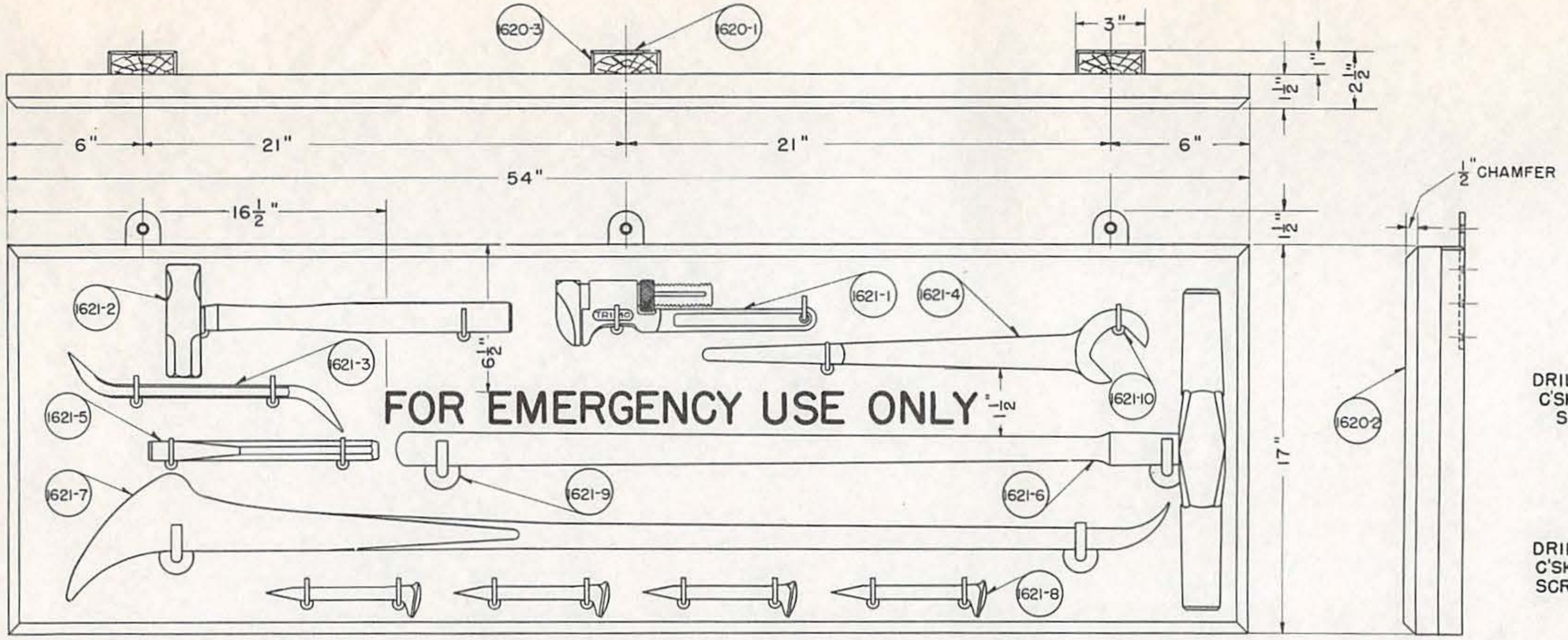
APPROVED: A. L. Jordan
Signal Engineer

Made & Corrected: 6-4-48.
4-2-52: Item No. 23 added.
9-9-53: File Numbers revised.
5-17-55: Items 7 & 21 rev.
5-9-56: Revised.
1-13-59: 1532 & 1532-1. rev.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR STYLE
"M2" OR "M22"A&B S.& L. MOVEMENT
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

SHEET NO. 2

S-161-F


1620-3
1620-1
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16½"
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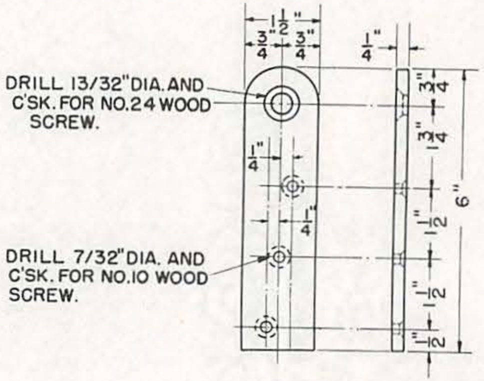
1621-2
1621-1
1621-4
6½"
1621-3
FOR EMERGENCY USE ONLY
1½"
1621-10
1621-5
1620-2
17"
1621-7
1621-9
1621-6
1621-8
TRIMO


1½"
¾"
¾"
¼"
DRILL 13/32"DIA. AND C'SK. FOR NO.24 WOOD SCREW.
¾"
¾"
¼"
6"
¼"
1½"
DRILL 7/32"DIA. AND C'SK. FOR NO.10 WOOD SCREW.
1½"
½"

HANGER-1620-1

S.A.E. 1020 STEEL

NOTE:

BOARD TO BE MADE OF WELL SEASONED OAK.
PAINT ONE FILLER COAT AND TWO COATS OF VARNISH.
LETTERS TO BE BLACK AS SHOWN.
ALL TOOLS TO BE PAINTED RED.
STANDARD CLAW BAR TO BE REWORKED TO 4'-0" OVERALL LENGTH.

TOOL BOARD WITHOUT TOOLS OR MOUNTING HOOKS-1620

NUMBER	REQ'D.	NAME
1620-1	3	HANGERS
1620-2	1	1½" X 17" X 54" OAK BOARD
1620-3	3	1" X 3" X 17" WOOD CLEATS
	24	NO. 10 X 1¾"-FLAT HD. WOOD SCREWS
	3	NO. 24 X 1½"-FLAT HD. WOOD SCREWS

TOOL BOARD COMPLETE WITH TOOLS - 1621

NUMBER	REQ'D.	NAME
1621-1	1	MONKEY WRENCH (12")
1621-2	1	(2LB.) STANDARD HAND HAMMER
1621-3	1	TOMMY BAR (16")
1621-4	1	SWITCH ADJUSTMENT WRENCH (RACO NO. 249-4)
1621-5	1	COLD CHISEL (10")
1621-6	1	SPIKE MAUL (14") ENG'R. M.W. DWG. 36170
1621-7	1	CLAW BAR (4'-0")
1621-8	4	STANDARD TRACK SPIKES
1621-9	4	HOOKS FOR MOUNTING MAUL AND CLAW BAR
1621-10	18	HOOKS FOR MOUNTING ALL OTHER TOOLS

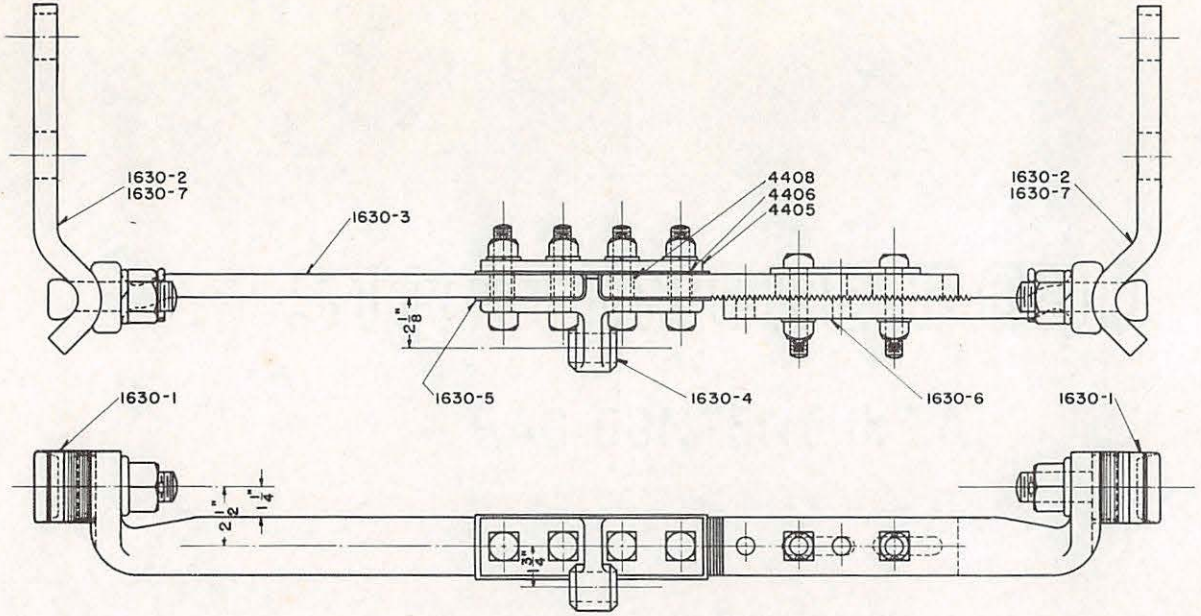
APPROVED: CBHarvey
CHIEF ENG'R. MAINTENANCE

APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
EMERGENCY TOOL BOARD
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 18, 1947

S-162

RECEIVED
OCT 18 1948
SPECIFICATION DEPT.
1 2 3 4 5 6 7 8 9 10 11 12

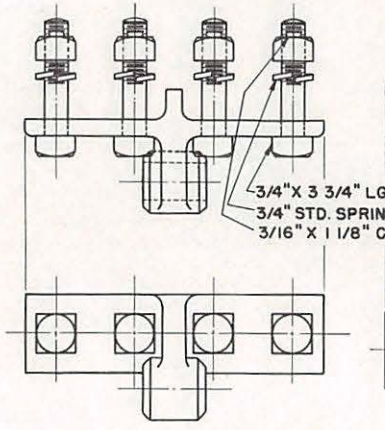

1630-2
1630-7
1630-3
4408
4406
4405
1630-2
1630-7
2 1/8"
1630-5
1630-4
1630-6
1630-1
1630-1
2 1/2"
1/4"
1 3/4"

SWIVEL FRONT ROD ASSEMBLY - **1630** OR **1631**

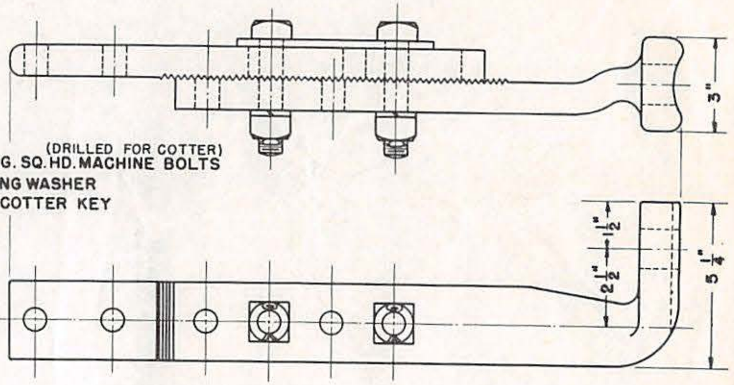
MATERIAL REQUIRED FOR ONE SWIVEL FRONT ROD COMPLETE

ITEM	ASSEMBLY 1630	ASSEMBLY 1631	NAME	PLAN NO.
1630-1	2	2	T-BOLTS	S-163
1630-2	2		SWIVEL LUGS	S-163
1630-3	1	1	HALF FRONT ROD - PLAIN	S-163
1630-4	1	1	SWITCH AJUSTMENT BRACKET	S-163
4405	1	1	SPLICE PLATE	25-44-A
4406	1	1	FIBRE INSULATION PLATE	25-44-A
1630-5	2	2	FIBRE INSULATION PLATES	S-163
4408	4	4	FIBRE INSULATION BUSHINGS	25-44-A
1630-6	1	1	HALF FRONT ROD - ADJUSTABLE	S-163
1630-7		2 .	SWIVEL LUGS	S-163

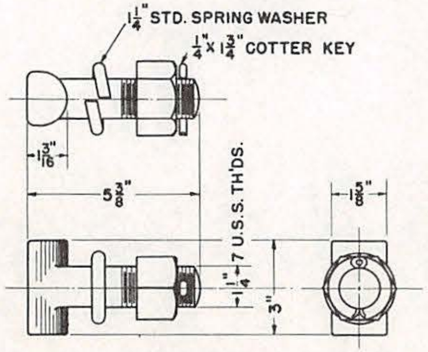
USE 1631 ASSEMBLY FOR AI-E.P.S.&L. LAYOUT
USE 1630 ASSEMBLY FOR ALL OTHER SWITCH LAYOUTS


(DRILLED FOR COTTER)
3/4"X 3 3/4" LG. SQ. HD. MACHINE BOLTS
3/4" STD. SPRING WASHER
3/16" X 1 1/8" COTTER KEY

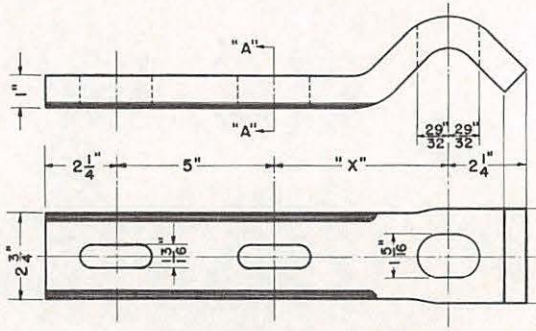
SWITCH ADJUSTMENT BRACKET - **1630-4**


3"
1 1/2"
2 1/2"
5 1/4"

HALF FRONT ROD - ADJUSTABLE - **1630-6**

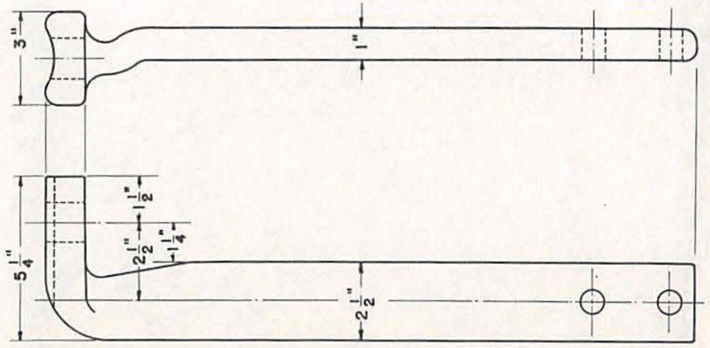

1 1/4" STD. SPRING WASHER
1/4" X 1 3/4" COTTER KEY
1 3/16"
5 3/8"
7 U.S.S. TH'DS.
1 1/4"
3"
1 5/8"

T-BOLT - **1630-1**


"A"
"A"
1"
29/32
29/32
2 1/4"
5"
"X"
2 1/4"
2 3/4"
13/16
5/16
3"

SWIVEL LUG - X = 5 1/4" - **1630-2**

SWIVEL LUG - X = 6 3/4" - **1630-7**

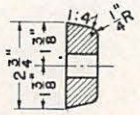

3"
1"
1 1/2"
1 1/2"
1 1/4"
5 1/4"
2 1/2"

HALF FRONT ROD - PLAIN - **1630-3**

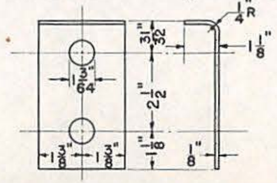
APPROVED: CBHarvey
CHIEF ENG'R. MAINTENANCE

APPROVED:
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SWIVEL TYPE FRONT ROD DETAILS & ASSEMBLY
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 7, 1948


1:4
1/4"R
3/8"
1/8
2 3/4"
3/8"
1/8

SECTION "A"-"A" - **1630-2-7**


1/4"R
31/32
1/8"
2 1/2"
1 1/8"
1/8"
3/4

FIBRE INSULATION PLATE - **1630-5**

SPECIFICATION DEPT.

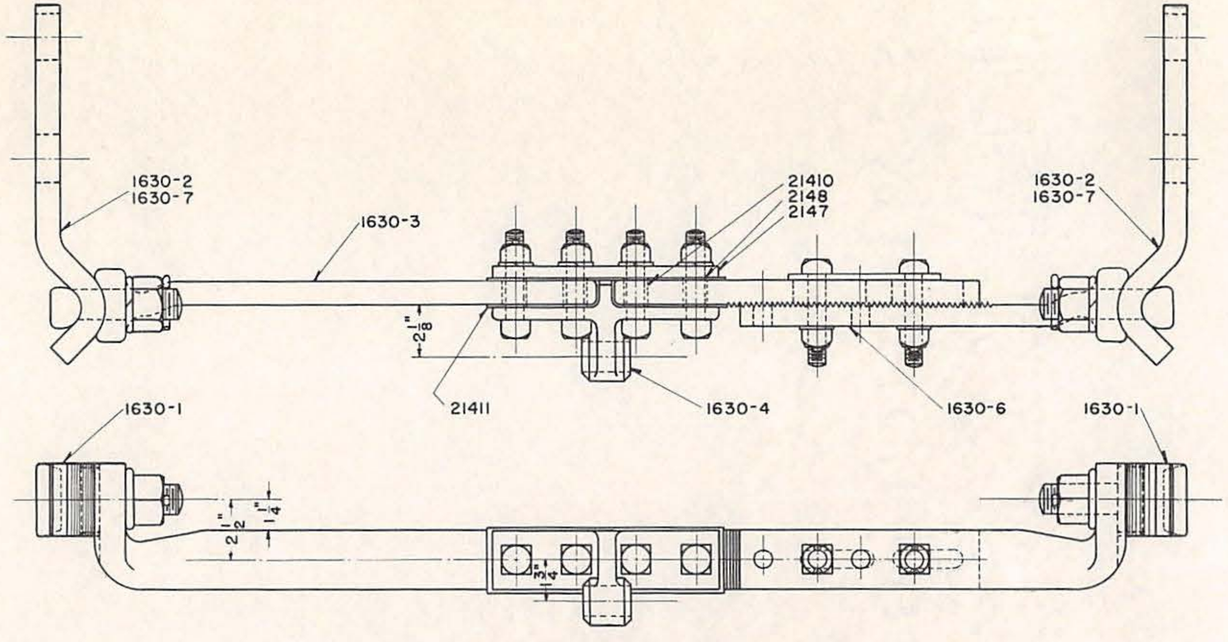
JUN 17

S-163

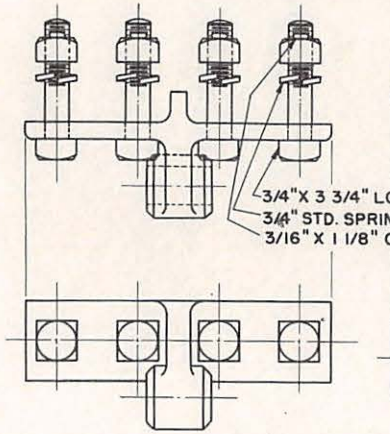
MATERIAL REQUIRED FOR ONE SWIVEL FRONT ROD COMPLETE

ITEM	ASSEMBLY 1630	ASSEMBLY 1631	NAME	PLAN NO.
1630-1	2	2	T-BOLTS	S-163
1630-2	2		SWIVEL LUGS	S-163
1630-3	1	1	HALF FRONT ROD-PLAIN	S-163
1630-4	1	1	SWITCH AJUSTMENT BRACKET	S-163
2147	1	1	SPLICE PLATE	S-214
2148	1	1	FIBRE INSULATION PLATE	S-214
21411	2	2	FIBRE INSULATION PLATES	S-214
21410	4	4	FIBRE INSULATION BUSHINGS	S-214
1630-6	1	1	HALF FRONT ROD-ADJUSTABLE	S-163
1630-7		2 .	SWIVEL LUGS	S-163

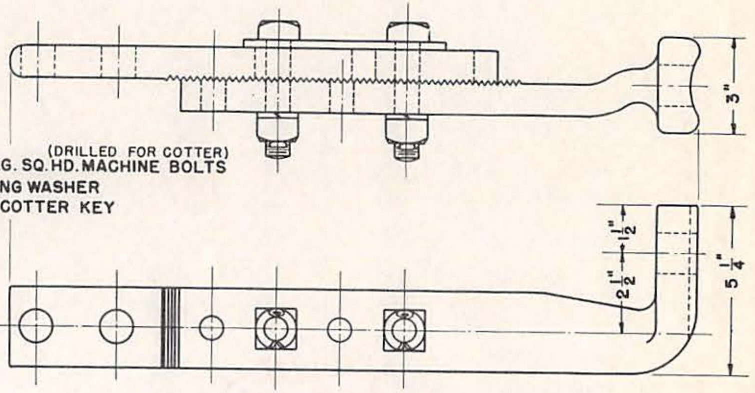
USE 1631 ASSEMBLY FOR A1-E.P.S.&L. LAYOUT
USE 1630 ASSEMBLY FOR ALL OTHER SWITCH LAYOUTS


1630-2
1630-7
1630-3
21410
2148
2147
1630-2
1630-7
$2\frac{1}{8}$"
21411
1630-4
1630-6
1630-1
1630-1
$2\frac{1}{2}$"
$1\frac{1}{4}$"
$\frac{3}{4}$"

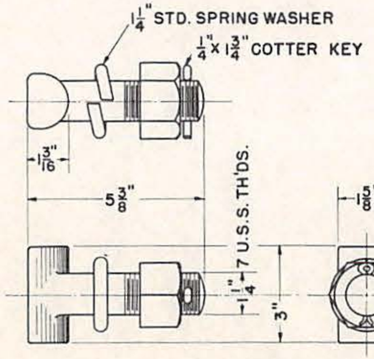
SWIVEL FRONT ROD ASSEMBLY - **1630** OR **1631**


(DRILLED FOR COTTER)
3/4" X 3 3/4" LG. SQ. HD. MACHINE BOLTS
3/4" STD. SPRING WASHER
3/16" X 1 1/8" COTTER KEY

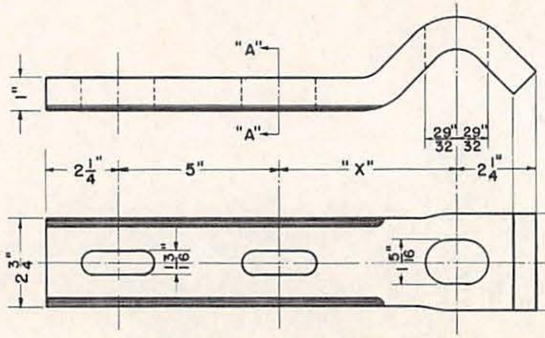
SWITCH ADJUSTMENT BRACKET - **1630-4**


3"
$1\frac{1}{2}$"
$2\frac{1}{2}$"
$5\frac{1}{4}$"

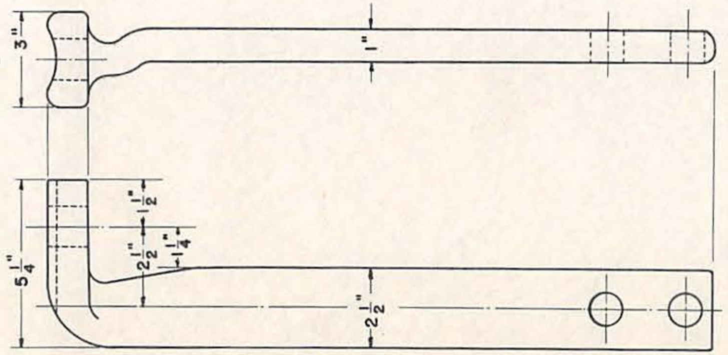
HALF FRONT ROD-ADJUSTABLE - **1630-6**

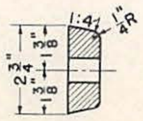

$1\frac{1}{4}$" STD. SPRING WASHER
$\frac{1}{4}$" X $1\frac{3}{4}$" COTTER KEY
$1\frac{3}{16}$"
$5\frac{3}{8}$"
$1\frac{5}{8}$"
$1\frac{1}{4}$"-7 U.S.S. TH'DS.
3"

T-BOLT - **1630-1**


"A"
"A"
1"
$\frac{29}{32}$"
$\frac{29}{32}$"
$2\frac{1}{4}$"
5"
"X"
$2\frac{1}{4}$"
$2\frac{3}{4}$"
$1\frac{3}{16}$"
$1\frac{5}{16}$"
3"

SWIVEL LUG - X = $5\frac{1}{4}$" - **1630-2**
SWIVEL LUG - X = $6\frac{3}{4}$" - **1630-7**


3"
1"
$1\frac{1}{2}$"
$2\frac{1}{2}$"
$1\frac{1}{4}$"
$5\frac{1}{4}$"
$2\frac{1}{2}$"


1:4
$\frac{1}{4}$"R
$\frac{3}{8}$"
$1\frac{1}{8}$"
$2\frac{3}{4}$"
$\frac{3}{8}$"
$1\frac{1}{8}$"

SECTION "A"-"A" - **1630-2-7**

HALF FRONT ROD-PLAIN - **1630-3**

APPROVED: CHIEF ENG'R. MAINTENANCE

APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SWIVEL TYPE FRONT ROD DETAILS & ASSEMBLY
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
JAN. 7, 1948

Revised 9-19-50: Account insulation shown on Plan S-214.

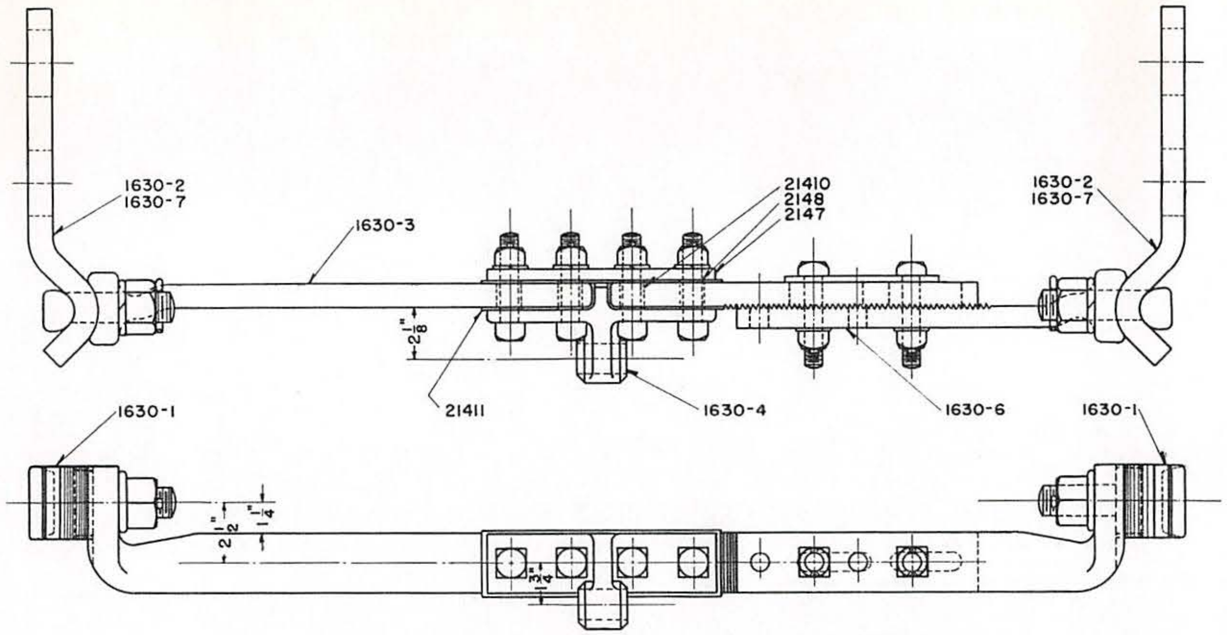
S-163-A

RECEIVED
NOV 16 1950
SPECIFICATION

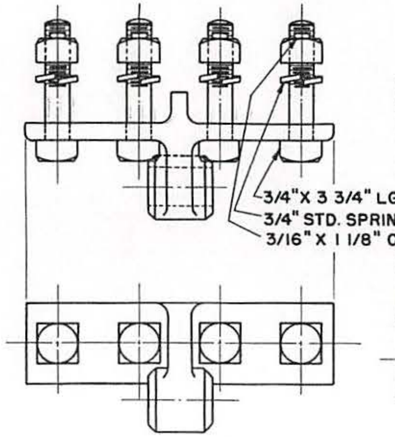
MATERIAL REQUIRED FOR ONE SWIVEL FRONT ROD COMPLETE

ITEM	ASSEMBLY 1630	ASSEMBLY 1631	NAME	PLAN NO.
1630-1	2	2	T-BOLT ASSEMBLY	S-163-D
1630-2	2		SWIVEL LUGS	S-163-D
1630-3	1	1	HALF FRONT ROD - PLAIN	S-163-D
1630-4	1	1	SWITCH AJUSTMENT BRACKET	S-163-D
2147	1	1	SPLICE PLATE	S-214
2148	1	1	FIBRE INSULATION PLATE	S-214
21411	2	2	FIBRE INSULATION PLATES	S-214
21410	4	4	FIBRE INSULATION BUSHINGS	S-214
1630-6	1	1	HALF FRONT ROD - ADJUSTABLE	S-163-D
1630-7		2	SWIVEL LUGS	S-163-D

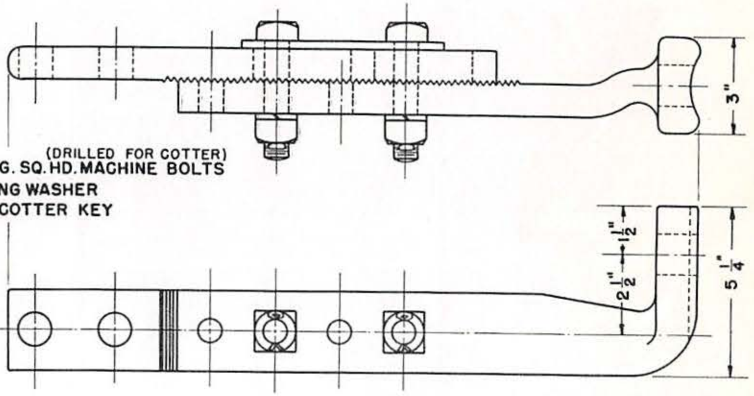
USE 1631 ASSEMBLY FOR A1-E.P.S.&L. LAYOUT
USE 1630 ASSEMBLY FOR ALL OTHER SWITCH LAYOUTS


1630-2
1630-7
1630-3
21410
2148
2147
1630-2
1630-7
2 1/8"
21411
1630-4
1630-6
1630-1
1630-1
2 1/2"
1 1/4"
3/4"

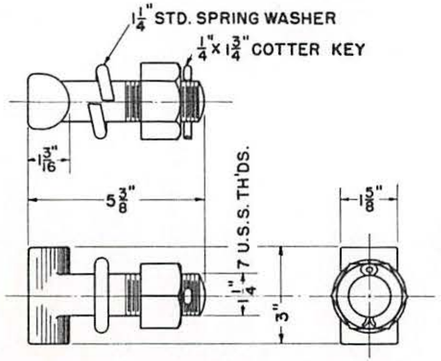
SWIVEL FRONT ROD ASSEMBLY (using Lug 1630-2) - 1630
SWIVEL FRONT ROD ASSEMBLY (using Lug 1630-7) - 1631


(DRILLED FOR COTTER)
3/4" X 3 3/4" LG. SQ. HD. MACHINE BOLTS
3/4" STD. SPRING WASHER
3/16" X 1 1/8" COTTER KEY

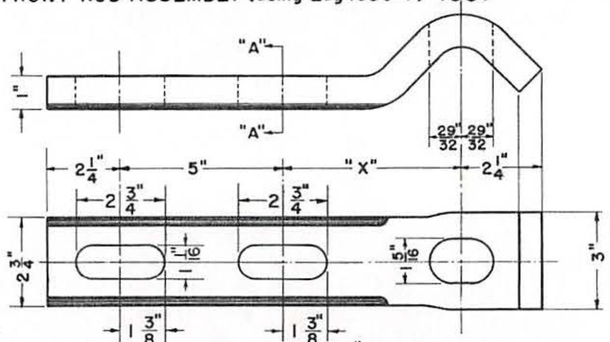
SWITCH ADJUSTMENT BRACKET - 1630-4


3"
1 1/2"
2 1/2"
5 1/4"

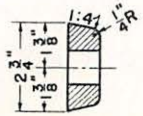
HALF FRONT ROD - ADJUSTABLE - 1630-6


1 1/4" STD. SPRING WASHER
1/4" X 1 3/4" COTTER KEY
1 3/16"
5 3/8"
7 U.S.S. TH'DS.
1 1/4"
3"
1 5/8"

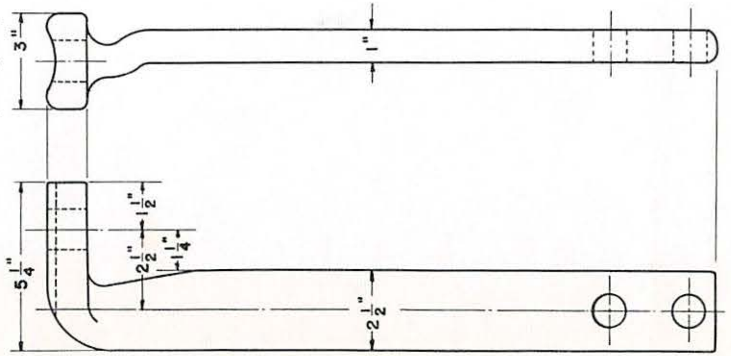
T-BOLT ASSEMBLY - 1630-1


"A"
"A"
1"
29/32"
29/32"
2 1/4"
5"
"X"
2 1/4"
2 3/4"
2 3/4"
2 3/4"
11/16"
15/16"
3"
1 3/8"
1 3/8"

SWIVEL LUG - X = 5 1/4" - 1630-2
SWIVEL LUG - X = 6 3/4" - 1630-7


1:41
1/4"R
3/8"
2 3/4"
1 3/8"

SECTION "A"-"A" - 1630-2-7


3"
1"
1 1/2"
2 1/2"
1 1/4"
5 1/4"
2 1/2"

HALF FRONT ROD - PLAIN - 1630-3

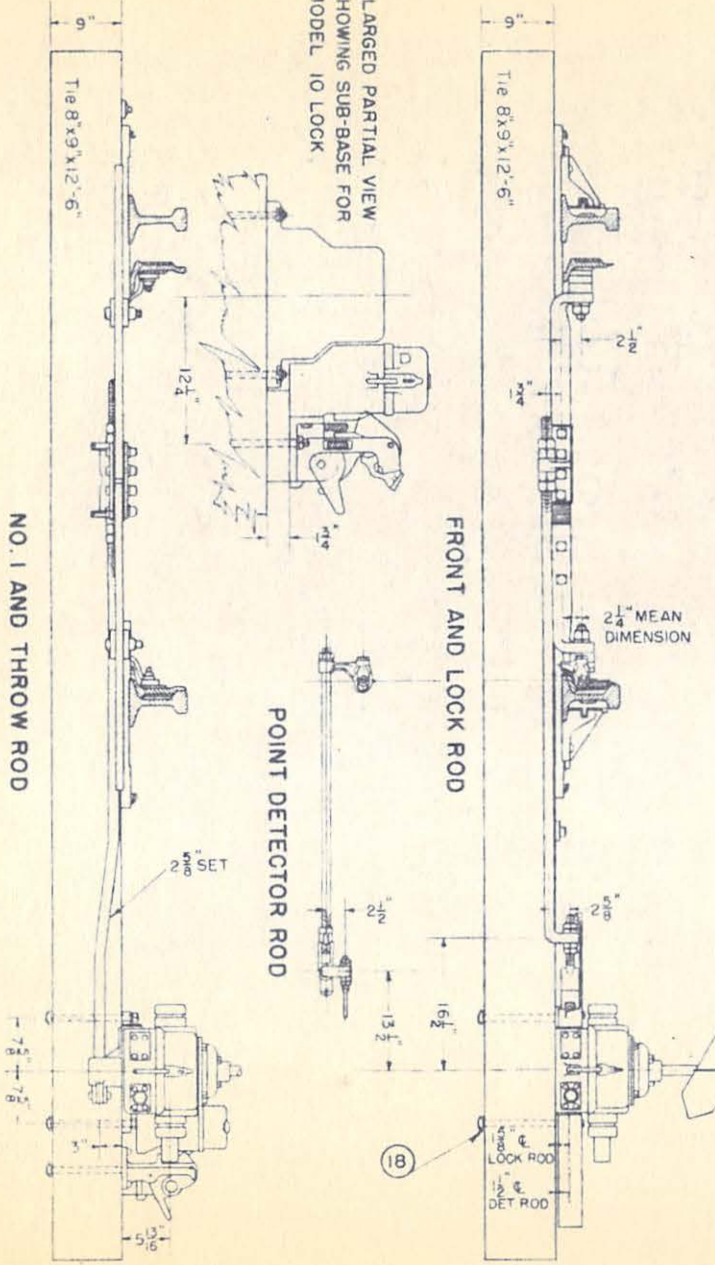
Approved: J.A. Caywood
Chief Engineer

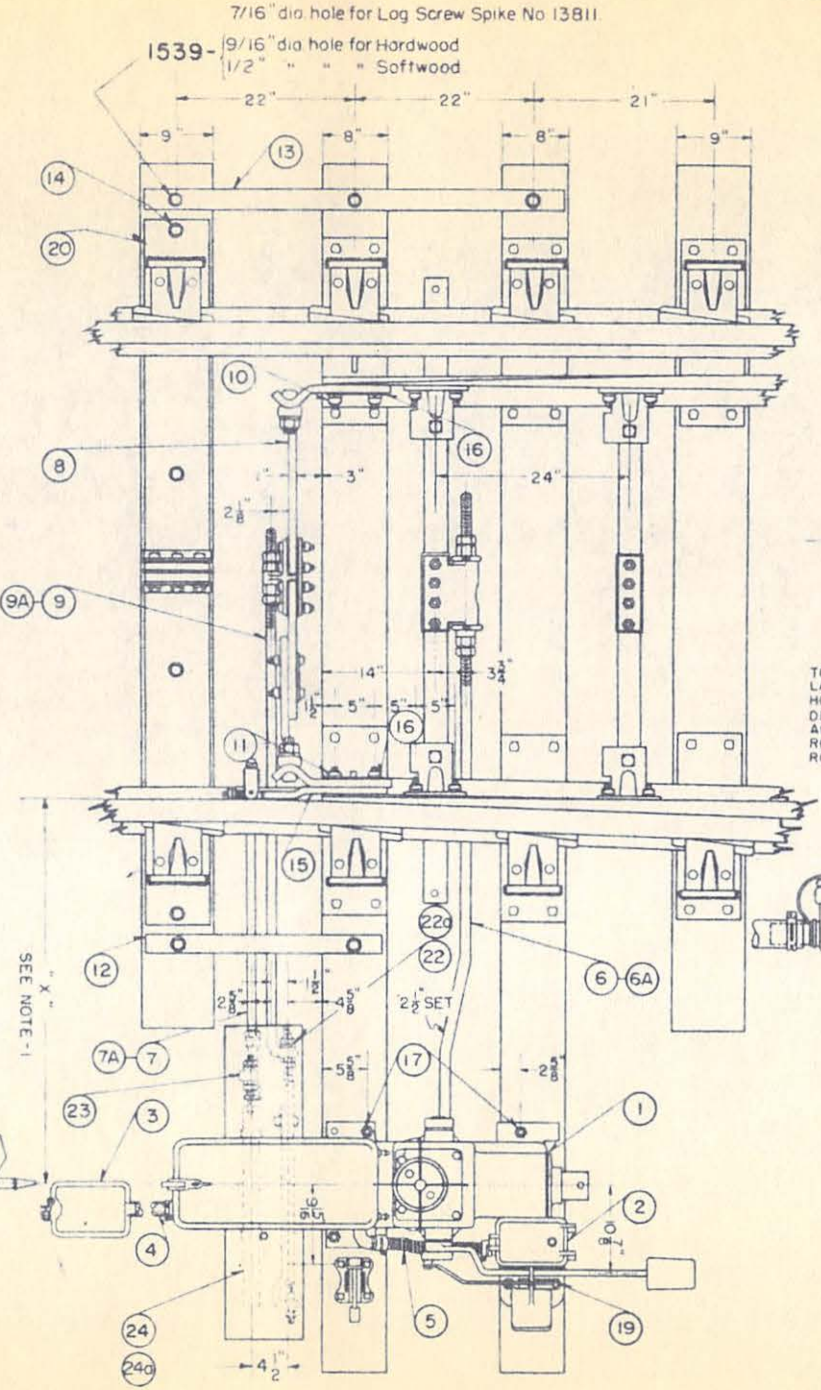
Approved: A.L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWIVEL TYPE FRONT ROD DETAILS & ASSEMBLY
Office of Signal Engineer
Baltimore, Md.
Sept. 27, 1963

Revised 9-19-50: Account insulation shown on Plan S-214
Revised 10-21-55- Assemblies changed.
Revised 9-27-63: 1630-2-7 revised to AREA Specs.

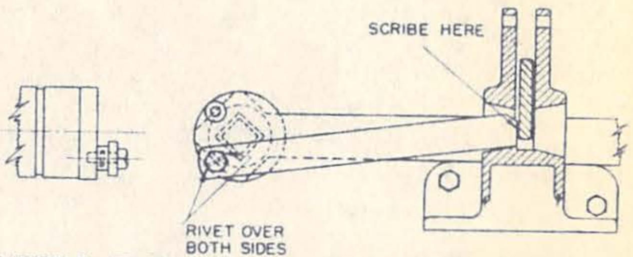
S-163-D


ENLARGED PARTIAL VIEW
SHOWING SUB-BASE FOR
MODEL 10 LOCK
NO. 1 AND THROW ROD
FRONT AND LOCK ROD
POINT DETECTOR ROD
Tie 8"x9"x12'-6"
Tie 8"x9"x12'-6"
9"
9"
$12\frac{1}{4}$"
$1\frac{3}{4}$"
$2\frac{1}{2}$"
$1\frac{3}{4}$"
$2\frac{1}{4}$" MEAN DIMENSION
$2\frac{5}{8}$" SET
$2\frac{1}{2}$"
$2\frac{5}{8}$"
$13\frac{1}{2}$"
$16\frac{1}{2}$"
$7\frac{5}{8}$"
$7\frac{5}{8}$"
3"
$5\frac{13}{16}$"
$1\frac{13}{16}$" ℄ LOCK ROD
$1\frac{1}{2}$" ℄ DET ROD
⑱

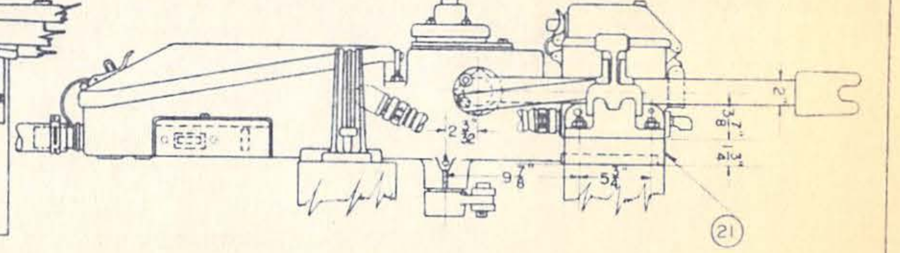

7/16" dia hole for Log Screw Spike No 13811
1539 - 9/16" dia hole for Hardwood
1/2" " " " Softwood
22"
22"
21"
9"
8"
8"
9"
3"
24"
$2\frac{1}{8}$"
14"
$1\frac{1}{2}$"
5"
5"
5"
$3\frac{3}{4}$"
$2\frac{5}{8}$"
$1\frac{1}{2}$"
$4\frac{5}{8}$"
$2\frac{1}{2}$" SET
$5\frac{5}{8}$"
$2\frac{5}{8}$"
$9\frac{5}{16}$"
$10\frac{7}{8}$"
$4\frac{1}{2}$"
"X"
SEE NOTE-1
⑭
⑬
⑳
⑩
⑧
⑯
9A-⑨
⑪
⑯
⑮
⑫
22a
㉒
6-6A
7A-⑦
⑰
㉓
③
①
②
④
⑤
⑲
㉔
24a

1. DIMENSION "X" SHALL BE 4'-0" FOR MACHINE WITH LOW TARGET STAFF AND 7'-0" FOR MACHINE WITH INTERMEDIATE TARGET STAFF.

2. MACHINE WILL BE FURNISHED WITH TARGET STAFF UNDRILLED AND WITHOUT TARGETS.


SCRIBE HERE
RIVET OVER
BOTH SIDES

TO ASSEMBLE LATCH ROD, PLACE THE SWITCH LEVER IN THE LOCKED POSITION AS SHOWN ON THE LAYOUT PLAN. DEPRESS THE FOOT PEDAL AND INSERT THE LATCH ROD THRU THE RECTANGULAR HOLE IN THE LOCK STAND. INSERT STUD BOLT THRU PIVOT HOLE IN LATCH ROD TEMPORARILY, DEPRESS LATCH AS FAR AS IT WILL GO. HOLD THE LATCH IN THIS POSITION AND SCRIBE ACROSS THE FACE OF THE LATCH ROD IN LINE WITH THE PEDAL CASTING REMOVE THE LATCH ROD AND CUT OFF THE END 1/32" SHORT OF THE SCRIBE MARK THEN CUT CORNER OF LATCH ROD AS SHOWN IN FIGURE ABOVE.


$2\frac{3}{32}$"
$9\frac{7}{8}$"
$5\frac{1}{4}$"
$3\frac{7}{8}$"
$1\frac{3}{4}$"
2
㉑

APPROVED: CRiley
Chief Engr. Maintenance

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK

Office of Signal Engineer
Baltimore, Md.
June 8, 1954

SHEET NO. 1

S-166-B

REFERENCE G R S CO PLAN NO 5139 370
8-2-54 Item 23 shown.
5-17-55 Items 7, 7A & 18 revised.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See Note A).	
2		1	Model 10 Electric Lock (See Note B).	
3	2291	1	16-way Junction Box Assembly.	S-229-A,sh.1
4	15311	1	Rubber Conduit Assembly	S-153-F,sh.2
5		1	1-1/2"dia. Flexible Steel Conduit.	
6	1848	1	Operating Rod Assembly.	S-184-B,sh.1
7	18211	1	Point Detector Connecting Rod Assembly.	S-182-B,sh.1
8	1630	1	Swivel Front Rod Assembly.	S-163-B
9	18313	1	Lock Rod Connecting Rod.	S-183-C,sh.2
10	1540	2	3/4"dia.x 4-1/4"long Front Foot Bolt Assembly.	S-154-D,sh.1
11	1541	2	3/4"dia.x 5" " " " " "	S-154-D,sh.1
12	1531-4	1	2-1/2"x1/2"x2'-5-1/2"long Tie Strap.	S-153-F,sh.1
13	1531-1	1	2-1/2"x1/2"x4'-4" " " "	S-153-F,sh.1
14	1539	9	Galvanized Drive Spike.	S-153-F,sh.2
15	1532	1	Switch Circuit Controller Lug Assembly.	S-153-F,sh.1
16	125512	2	Switch Lug Plates.	S-364
17		4	3/4"dia.x12"long Sq.Hd. Machine Bolt with Hex. Nut & Spring Washer.	
18	15320	6	Raco Bolt Grip for 3/4" dia. Bolt (Raco No. 589-1).	S-153-F,sh.3
19		2	3/4"dia.x1'-1-5/8"long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
20		1	No.1 Insulated Gauge Plate Assembly	37020
21	1590	1	Cast-Iron Subbase	S-159-B,sh.2
* 22	18331	1	Adjustable Lock Rod Assembly (for Right Hand layout)	S-183-C,sh.4
23	18240	1	Detector Rod Lug	S-182-B,sh.4
+ 24	18243	1	Point Detector Rod Assembly (for Closed Point layout)	S-182-B,sh.6
FOR LAYOUT WITH INTERMEDIATE TARGET STAFF				
6A	1849	1	Operating Rod Assembly.	S-184-B,sh.1
7A	18212	1	Point Detector Connecting Rod Assembly.	S-182-B,sh.1
9A	18314	1	Lock Rod Connecting Rod.	S-183-C,sh.2

* 22a	18330	1	Adjustable Lock Rod Assembly (for Left Hand layout)	- S-183-C,sh.4.
+ 24a	18244	1	Point Detector Rod Assembly (for Open Point layout)	- S-182-B, sh.6.

Notes:

a - For Switch Machines see G.R.S. Co. Catalogue Section J Part 39, Model 9 Hand Operated Switch Machine and furnish information required.

b - Unless otherwise specified Model 10 Electric Lock will be furnished in accordance with the following description.
"Model 10 Electric Lock, 12 volt D.C. operation, complete with Emergency Release and Internal Connection Diagram Dwg. 58447-4, for application to Model 9 Hand Operated Switch Machine. G.R.S. Co. See Standard Plan S-159-B, sh.4 for further information.

Approved: A.C. Riley
Chief Eng'r. Maintenance

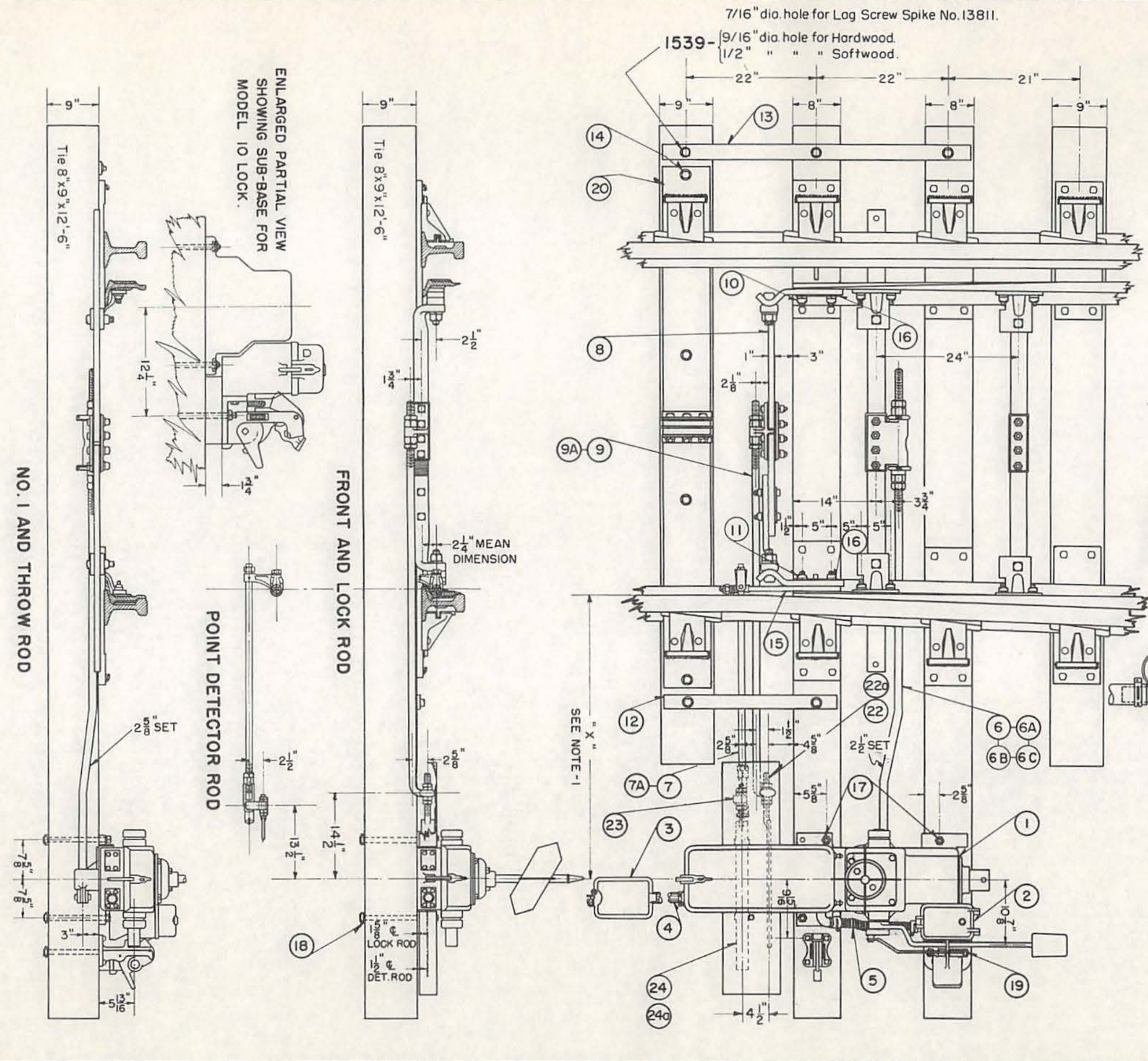
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK
Office of Signal Engineer
Baltimore, Md.
June 8, 1954

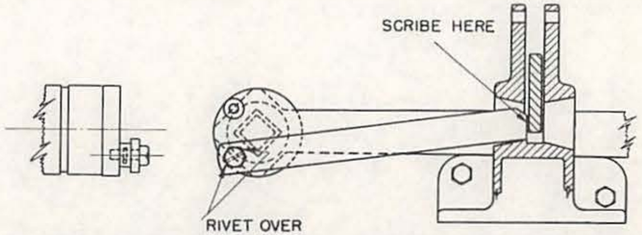
8-2-54 Item 23 shown.
5-17-55 Items 7, 7A & 18 revised.

Sheet No. 2

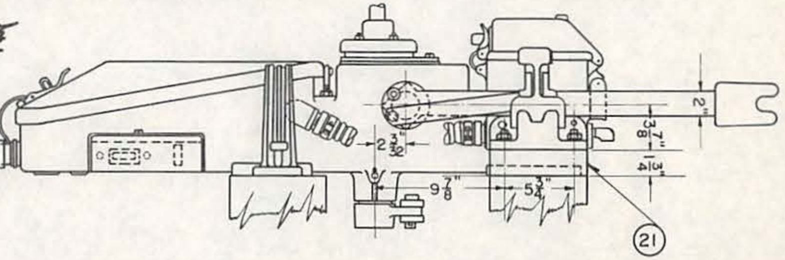
S-166-B


7/16" dia. hole for Lag Screw Spike No. 13811.
1539- 9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
22"
22"
21"
9"
8"
8"
9"
Tie 8"x9"x12'-6"
Tie 8"x9"x12'-6"
ENLARGED PARTIAL VIEW SHOWING SUB-BASE FOR MODEL 10 LOCK.
NO. 1 AND THROW ROD
FRONT AND LOCK ROD
POINT DETECTOR ROD
12¼"
1¾"
2½"
1¾"
2¼" MEAN DIMENSION
2⅝" SET
2½"
2⅝"
13½"
14½"
7⅝"
7⅝"
3"
5 13/16"
1 5/8" ℄ LOCK ROD
1½" ℄ DET. ROD
"X" SEE NOTE-1
1"
3"
2⅛"
24"
14"
1½"
5"
5"
5"
3¾"
2⅝"
4⅝"
1½"
2½" SET
5⅝"
2⅝"
9 5/16"
10⅞"
4½"
(1) (2) (3) (4) (5) (6) (6A) (6B) (6C) (7) (7A) (8) (9) (9A) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (22) (22a) (23) (24) (24a)

1. DIMENSION "X" SHALL BE 4'-0" FOR MACHINE WITH LOW TARGET STAFF AND 7'-0" FOR MACHINE WITH INTERMEDIATE TARGET STAFF.
2. MACHINE WILL BE FURNISHED WITH TARGET STAFF UNDRILLED AND WITHOUT TARGETS.


SCRIBE HERE
RIVET OVER BOTH SIDES

TO ASSEMBLE LATCH ROD, PLACE THE SWITCH LEVER IN THE LOCKED POSITION AS SHOWN ON THE LAYOUT PLAN. DEPRESS THE FOOT PEDAL AND INSERT THE LATCH ROD THRU THE RECTANGULAR HOLE IN THE LOCK STAND. INSERT STUD BOLT THRU PIVOT HOLE IN LATCH ROD TEMPORARILY, DEPRESS LATCH AS FAR AS IT WILL GO. HOLD THE LATCH IN THIS POSITION AND SCRIBE ACROSS THE FACE OF THE LATCH ROD IN LINE WITH THE PEDAL CASTING. REMOVE THE LATCH ROD AND CUT OFF THE END 1/32" SHORT OF THE SCRIBE MARK. THEN CUT CORNER OF LATCH ROD AS SHOWN IN FIGURE ABOVE.


2"
2 3/32"
9⅞"
5¾"
3 7/8"
3/4"
(21)

APPROVED: C. Riley
Chief Engineer
Construction & Maintenance

APPROVED: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

SHEET NO. 1

S-166-D

Reference: G. R. S. Co. Plan No. 51139-370. 1-13-59: 1532 & 1532-1 rev.
8-2-54: Item 23 shown.
5-17-55: Items 7, 7A & 18 revised.
1-28-57: Item 22 changed, Items 9-9A revised.
6-28-58 : Item 6b & 6C added.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See Note A).	
2		1	Model 10 Electric Lock (See Note B).	
3	2291	1	16-way Junction Box Assembly.	S-229-A,sh.1
4	15311	1	Rubber Conduit Assembly.	S-153-H,sh.2
5		1	1-1/2"dia. Flexible Steel Conduit.	
⊕ 6	1848	1	Operating Rod Assembly.(for Right Hand Layout)	S-184-D,sh.1
7	18211	1	Point Detector Connecting Rod Assembly.	S-182-B,sh.1
8	1630	1	Swivel Front Rod Assembly.	S-163-C
9	18313	1	Lock Rod Connecting Rod.	S-183-D,sh.2
10	1540	2	3/4"dia.x 4-1/4"long Front Foot Bolt Assembly.	S-154-F,sh.1
11	1541	2	3/4"dia.x 5" " " " " "	S-154-F,sh.1
12	1531-4	1	2-1/2"x1/2"x2'-5-1/2" long Tie Strap.	S-153-H,sh.1
13	1531-1	1	2-1/2"x1/2"x4'-4" " " "	S-153-H,sh.1
14	1539	9	Galvanized Drive Spike.	S-153-H,sh.2
15	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H,sh.1
16	125512	2	Switch Lug Plates.	S-364
17		4	3/4"dia.x12"long Sq.Hd. Machine Bolt with Hex. Nut & Spring Washer.	
18	15320	6	Raco Bolt Grip for 3/4" dia. Bolt (Raco No. 589-1).	S-153-H,sh.3
19		2	3/4"dia.x1'-1-5/8"long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
20		1	No.1 Insulated Gauge Plate Assembly (Shown on Pg.207 Roadway & Track Standard Plan)	37020
21	1590	1	Cast-Iron Subbase	S-159-B,sh.2
✻ 22	18343	1	Single Lock Rod Assembly (for Right Hand layout)	S-183-D,sh.7
23	18240	1	Detector Rod Lug	S-182-B,sh.4
+ 24	18243	1	Point Detector Rod Assembly (for Closed Point layout)	S-182-B,sh.6
FOR LAYOUT WITH INTERMEDIATE TARGET STAFF				
△ 6A	1849	1	Operating Rod Assembly.(for Right Hand Layout)	S-184-D,sh.1
7A	18212	1	Point Detector Connecting Rod Assembly.	S-182-B,sh.1
9A	18314	1	Lock Rod Connecting Rod.	S-183-D,sh.2
△ 6C	18421	1	Operating Rod Assembly (for Left Hand Layout)	S-184-D,sh.3

✻ 22a	18345	1	Single Lock Rod Assembly	(for Left Hand layout)	- S-183-D,sh.7.
+ 24a	18244	1	Point Detector Rod Assembly	(for Open Point layout)	- S-182-B,sh.6.
⊕ 6b	18420	1	Operating Rod Assembly	(for Left Hand layout)	- S-184-D,sh.3.

Notes:

a - For Switch Machines see G.R.S.Co. Catalogue Section J Part 39, Model 9 Hand Operated Switch Machine and furnish information required.

b - Unless otherwise specified Model 10 Electric Lock will be furnished in accordance with the following description: "Model 10 Electric Lock, 12 volt D.C. operation, complete with Emergency Release and Internal Connection Diagram Dwg. 58447-4, for application to Model 9 Hand Operated Switch Machine. G.R.S.Co. See Standard Plan S-159-B, sh.4 for further information

Approved: C. Riley
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

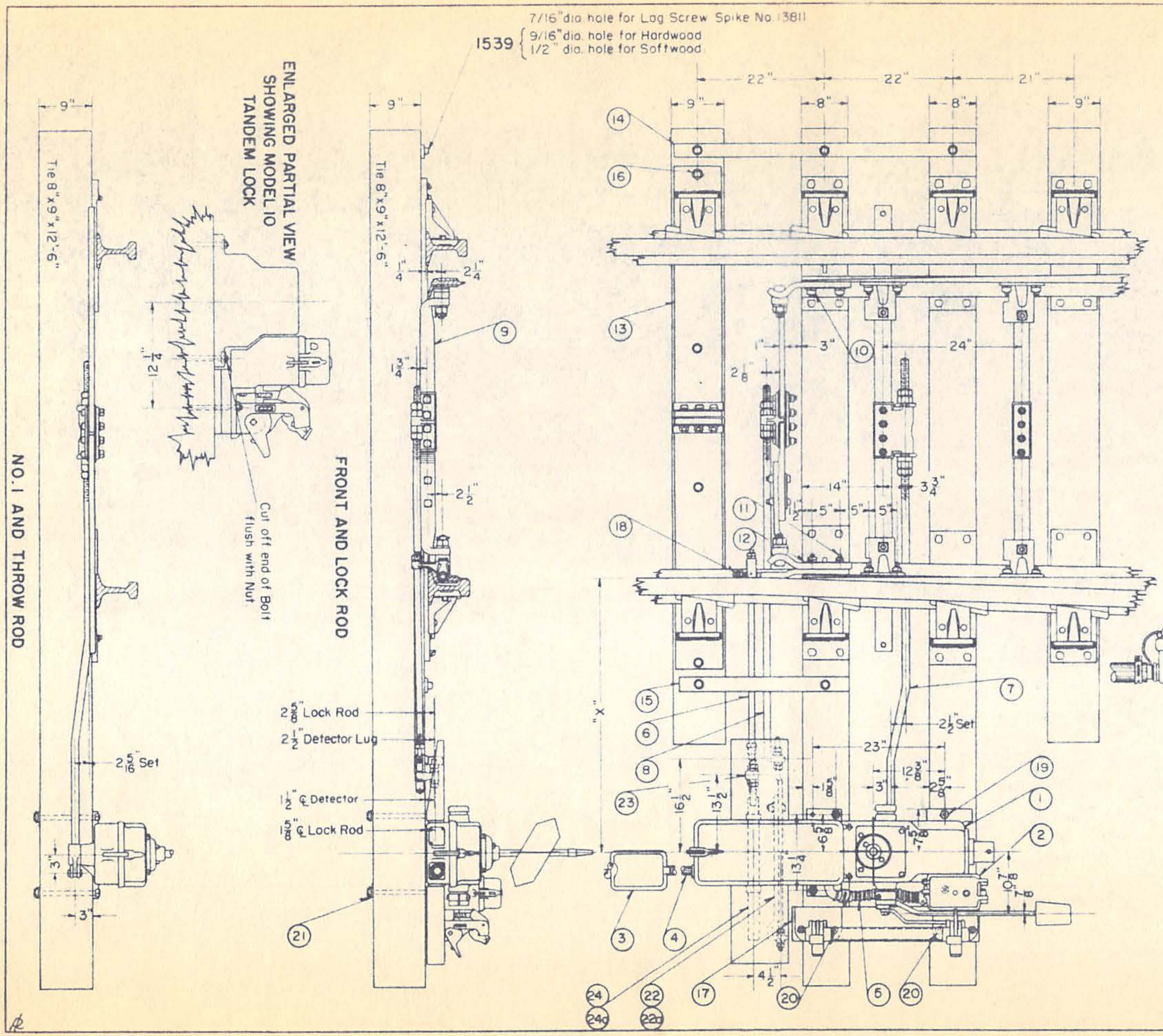
MATERIAL LIST FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

8-2-54: Item 23 shown.
5-17-55: Items 7, 7A & 18 shown.
5-9-56: Rev.
1-28-57: Item 22 changed, Items 9-9A revised.
6-27-58: Item 6B & 6C added.
1-13-59: 1532 & 1532-1 rev.

Sheet No. 2

S-166-D



7/16" dia. hole for Lag Screw Spike No. 13811
1539 { 9/16" dia. hole for Hardwood
1/2" dia. hole for Softwood
ENLARGED PARTIAL VIEW SHOWING MODEL 10 TANDEM LOCK
Cut off end of Bolt flush with Nut
NO. 1 AND THROW ROD
FRONT AND LOCK ROD
Tie 8"x 9"x 12'-6"
Tie 8"x 9"x 12'-6"
9"
9"
22"
22"
21"
9"
8"
8"
9"
1"
2 1/4"
1 3/4"
2 1/2"
12 1/4"
2 5/16" Set
3"
3"
2 5/8" Lock Rod
2 1/2" Detector Lug
1 1/2" ℄ Detector
1 5/8" ℄ Lock Rod
1"
3"
24"
2 1/8"
14"
3 3/4"
1 1/2"
5"
5"
5"
"X"
2 1/2" Set
23"
12 3/8"
2 5/8"
3"
1 5/8"
16 1/2"
13 1/2"
6 5/8"
13 1/4"
7 5/8"
10 7/8"
7/8
4 1/2"
①
②
③
④
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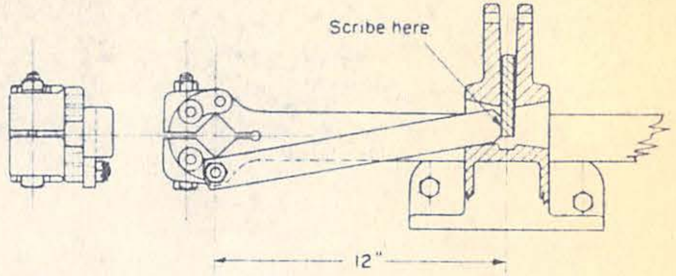
㉔
㉔a

Notes:

Dimension "X" shall be 4'-0" for machine with low target staff and 7'-0" for machine with intermediate target staff.

Machine will be furnished with undrilled target staff. Banners for target staff shall be secured from Martinsburg.



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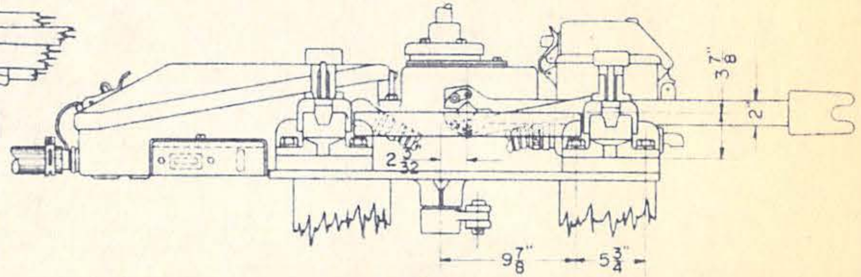


3 7/8"
2"
2 3/32
9 7/8"
5 3/4"

Approved ______ Chief Eng'r. Maintenance

Approved A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

Office of Signal Engineer
Baltimore, Md.
Sept 6, 1953

Sheet No. 1

S-167-B

Adopted 1-12-54.
Revised 3-29-55.
5-17-55: Items 6, 6A & 21 changed

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

ITEM	NUMBER	REQD.	NAME	DRAWING
1		1	Model 9 Hand Throw Switch Machine (See Note).	
2		1	Model 10 Electric Lock (See Note).	
3	2292	1	16-way Junction Box Assembly	S-229-A,sh.2
4	15311	1	Rubber Conduit Assembly.	S-153-F sh.2
5	43355-9	1	Conduit 1-1/4" Single Strip G.R.S.Co.	51139-465Gr.1
6	18211	1	Point Detector Connecting Rod Assembly	S-182-B,sh.1
7	1848	1	Operating Rod Assembly.	S-184-B sh.1
8	18313	1	Lock Rod Connecting Rod.	S-183-C,sh.2
9	1630	1	Swivel Front Rod Assembly.	S-163-B
10	1540	2	3/4"Dia.x 4-1/4" long Front Foot Bolt Assembly.	S-154-D,sh.1
11	1541	2	3/4"Dia.x 5" " " " " "	S-154-D,sh.1
12	125512	2	Switch Lug Plates.	S-364
13		1	No.1 Insulated Gauge Plate Assembly. M of W	37020
14	1531-1	1	2-1/2"x 1/2"x 4'-4" long Tie Strap.	S-153-F,sh.1
15	1531-4	1	2-1/2"x 1/2"x 2'-5-1/2" long Tie Strap.	S-153-F,sh.1
16	1539	9	Galvanized Drive Spike	S-153-F,sh.2
17		1	Tandem Assembly.	
18	1532	1	Switch Circuit Controller Lug Assembly.	S-153-F,sh.1
19		4	3/4"-10 x 12" long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
20		2	3/4"-10 x 13-5/8" long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
21	15320	6	Raco Bolt Grip for 3/4" dia. Bolt (Raco No. 589-1).	S-153-F,sh.3
*22	18331	1	Adjustable Lock Rod Assembly (for Right Hand layout)	S-183-C,sh.4
23	18240	1	Detector Rod Lug	S-182-B,sh.4
+24	18243	1	Point Detector Rod Assembly (for Closed Point layout)	S-182-B,sh.6
			FOR LAYOUT WITH INTERMEDIATE TARGET STAFF	
6A	18212	1	Point Detector Connecting Rod Assembly	S-182-B,sh.1
7A	1849	1	Operating Rod Assembly.	S-184-B,sh.1
8A	18314	1	Lock Rod Connecting Rod.	S-183-C,sh.2

*22a 18330 1 Adjustable Lock Rod Assembly (for Left layout) S-183-C, sh.4

+24a 18244 1 Point Detector Rod Assembly (for Open Point layout) S-182-B,sh.6

Notes:

For Switch Machines see G.R.S.Co. Catalogue, Section J, Part 39, Model 9 Hand Operated Switch Machine and furnish information required.

Unless otherwise specified Model 10 Electric Lock will be furnished in accordance with the following description, "Model 10 Electric Lock, 12 Volt D.C. Operation, complete with Emergency Release and Internal Connection Diagram Drawing 58447-4, for application to Model 9 Hand Operated Switch Machine, G.R.S.Co."

Approved ______________
Chief Eng'r. Maintenance

Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

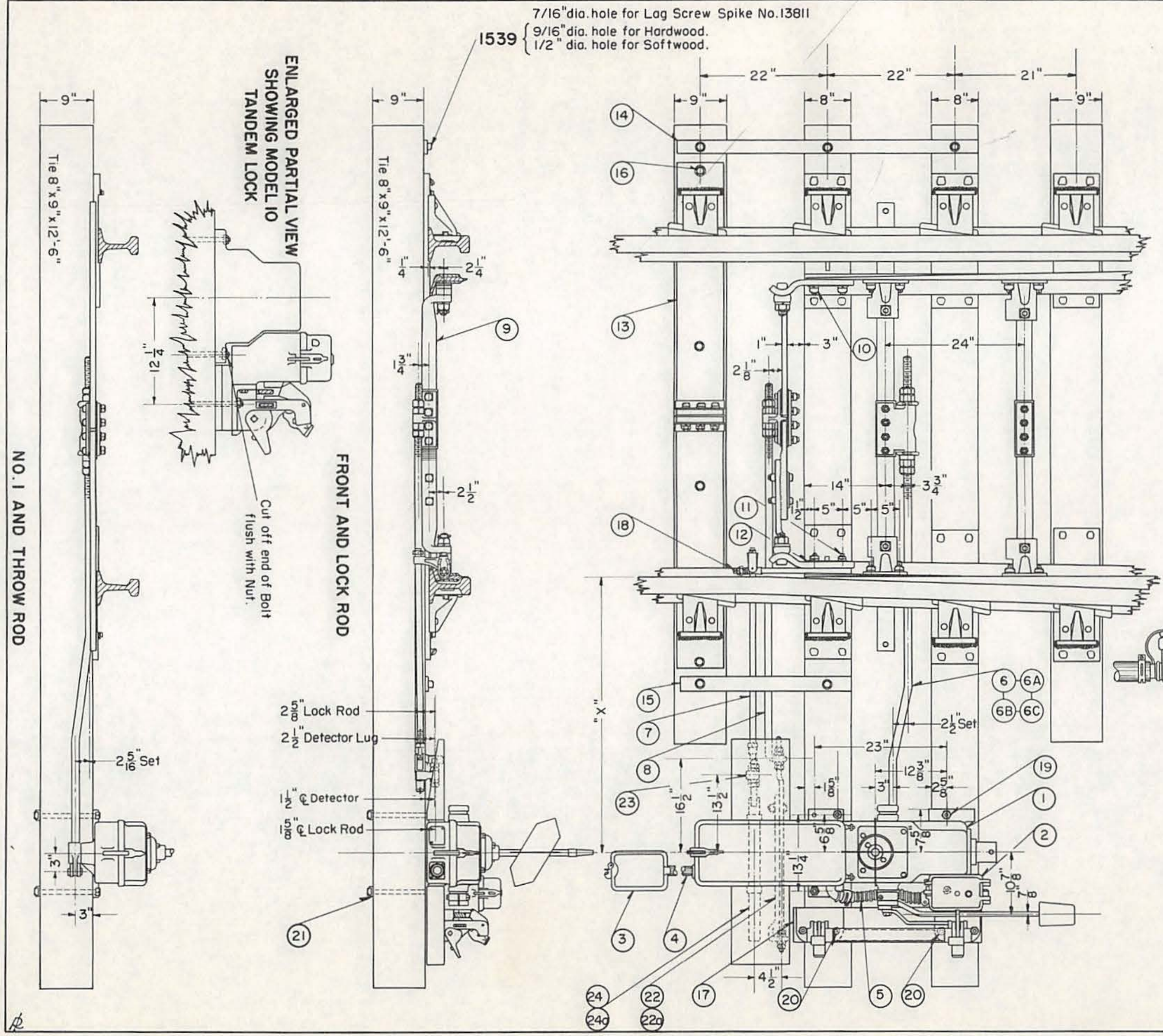
MATERIAL LIST FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

Office of Signal Engineer
Baltimore, Md
Sept. 6, 1952

Adopted 1-12-54
5-17-55 Items 6, 6A & 21 changed

Sheet No.2

S-167-B


7/16"dia. hole for Lag Screw Spike No.13811
1539 { 9/16"dia. hole for Hardwood.
1/2" dia. hole for Softwood.
ENLARGED PARTIAL VIEW SHOWING MODEL 10 TANDEM LOCK
FRONT AND LOCK ROD
NO. 1 AND THROW ROD
Tie 8"x9"x12'-6"
Tie 8"x9"x12'-6"
9"
9"
22"
22"
21"
9"
8"
8"
9"
1/4"
2 1/4"
12 1/4"
1 3/4"
2 1/2"
Cut off end of Bolt flush with Nut.
2 5/8" Lock Rod
2 1/2" Detector Lug
1 1/2" ℄ Detector
1 5/8" ℄ Lock Rod
2 5/16" Set
3"
3"
1"
3"
24"
2 1/8"
14"
3 3/4"
1 1/2"
5"
5"
5"
"X"
2 1/2" Set
23"
12 3/8"
3"
2 5/8"
1 5/8"
16 1/2"
13 1/2"
6 5/8"
13 1/4"
7 5/8"
10 7/8"
4 1/2"
1
2
3
4
5
6
6A
6B
6C
7
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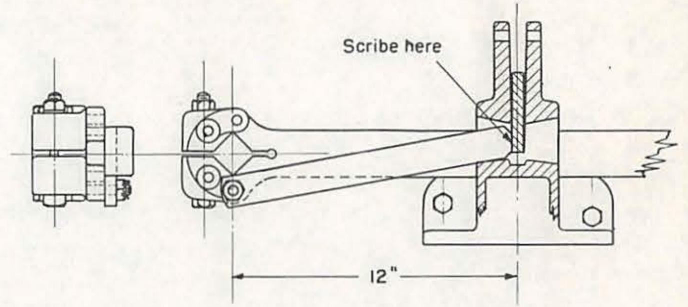
9
10
11
12
13
14
15
16
17
18
19
20
20
21
22
22a
23
24
24a

Notes:

Dimension "X" shall be 4'-0" for machine with low target staff and 7'-0" for machine with intermediate target staff.

Machine will be furnished with undrilled target staff. Banners for target staff shall be secured from Martinsburg.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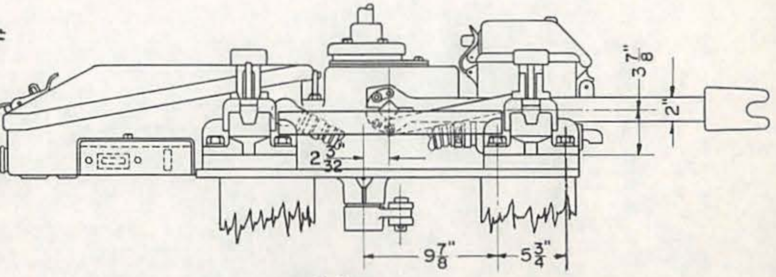

3 7/8"
2"
2 5/32"
9 7/8"
5 3/4"

Approved: C. Riley
Chief Engineer
Construction & Maintence

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

Office of Signal Engineer
Baltimore , Md.
Jan. 13 , 1959

Sheet No. 1

S-167-D

Made & Correction 9-6-53.
Adopted: 1-12-54.
3-29-55: Rev.
5-17-55: Items 6,6A & 21 changed.
6-27-58: Items 6b & 6c added.
1-13-59: 1532 & 1532-1 rev.

MATERIAL REQUIRED FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Model 9 Hand Throw Switch Machine (See Note).	
2		1	Model 10 Electric Lock (See Note).	
3	2292	1	16-way Junction Box Assembly	S-229-A,sh.2
4	15311	1	Rubber Conduit Assembly.	S-153-H sh.2
5	43355-9	1	Conduit 1-1/4" Single Strip. G.R.S.Co.	51139-465Gr.1
⊕ 6	1848	1	Operating Rod Assembly (for Right Hand Layout)	S-184-D,sh.1
7	18211	1	Point Detector Connecting Rod Assembly	S-182-B sh.1
8	18313	1	Lock Rod Connecting Rod.	S-183-D,sh.2
9	1630	1	Swivel Front Rod Assembly.	S-163-C
10	1540	2	3/4"Dia.x 4-1/4" long Front Foot Bolt Assembly.	S-154-F,sh.1
11	1541	2	3/4"Dia.x 5" " " " " "	S-154-F,sh.1
12	125512	2	Switch Lug Plates.	S-364
13		1	No.1 Insulated Gauge Plate Assembly. (Shown on Pg.207 Roadway & Track Standard Plan.)	37020
14	1531-1	1	2-1/2"x 1/2"x 4'-4" long Tie Strap.	S-153-H,sh.1
15	1531-4	1	2-1/2"x 1/2"x 2'-5-1/2" long Tie Strap.	S-153-H,sh.1
16	1539	9	Galvanized Drive Spike	S-153-H,sh.2
17		1	Tandem Assembly.	
18	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H,sh.1
19		4	3/4"-10 x 12" long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
20		2	3/4"-10 x 13-5/8" long Sq.Hd. Machine Bolt with Hex.Nut & Spring Washer.	
21	15320	6	Raco Bolt Grip for 3/4" dia. Bolt (Raco No.589-1).	S-153-H,sh.3
*22	18331	1	Adjustable Lock Rod Assembly (for Right Hand layout)	S-183-D,sh.4
23	18240	1	Detector Rod Lug	S-182-B,sh.4
+24	18243	1	Point Detector Rod Assembly (for Closed Point layout)	S-182-B,sh.6
FOR LAYOUT WITH INTERMEDIATE TARGET STAFF				
△ 6A	1849	1	Operating Rod Assembly (for Right Hand Layout)	S-184-D,sh.1
7A	18212	1	Point Detector Connecting Rod Assembly	S-182-B,sh.1
8A	18314	1	Lock Rod Connecting Rod.	S-183-D,sh.2
△ 6C	18421	1	Operating Rod Assembly (for Left Hand Layout	S-184-D,sh.3

*22a	18330	1	Adjustable Lock Rod Assembly (for Left Layout) S-183-D,sh.4.
+24a	18244	1	Point Detector Rod Assembly (for Open Point Layout) S-182-B,sh.6.
⊕ 6b	18420	1	Operating Rod Assembly (for Left Hand Layout) S-184-D,sh.3.

Notes:

For Switch Machines see G.R.S.Co. Catalogue, Section J, Part 39, Model 9 Hand Operated Switch Machine and furnish information required.

Unless otherwise specified Model 10 Electric Lock will be furnished in accordance with the following description, "Model 10 Electric Lock, 12 Volt D.C. Operation, complete with Emergency Release and Internal Connection Diagram Drawing 58447-4, for application to Model 9 Hand Operated Switch Machine, G.R.S.Co."

Approved: ______________ Chief Engineer Construction & Maintenance

Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD

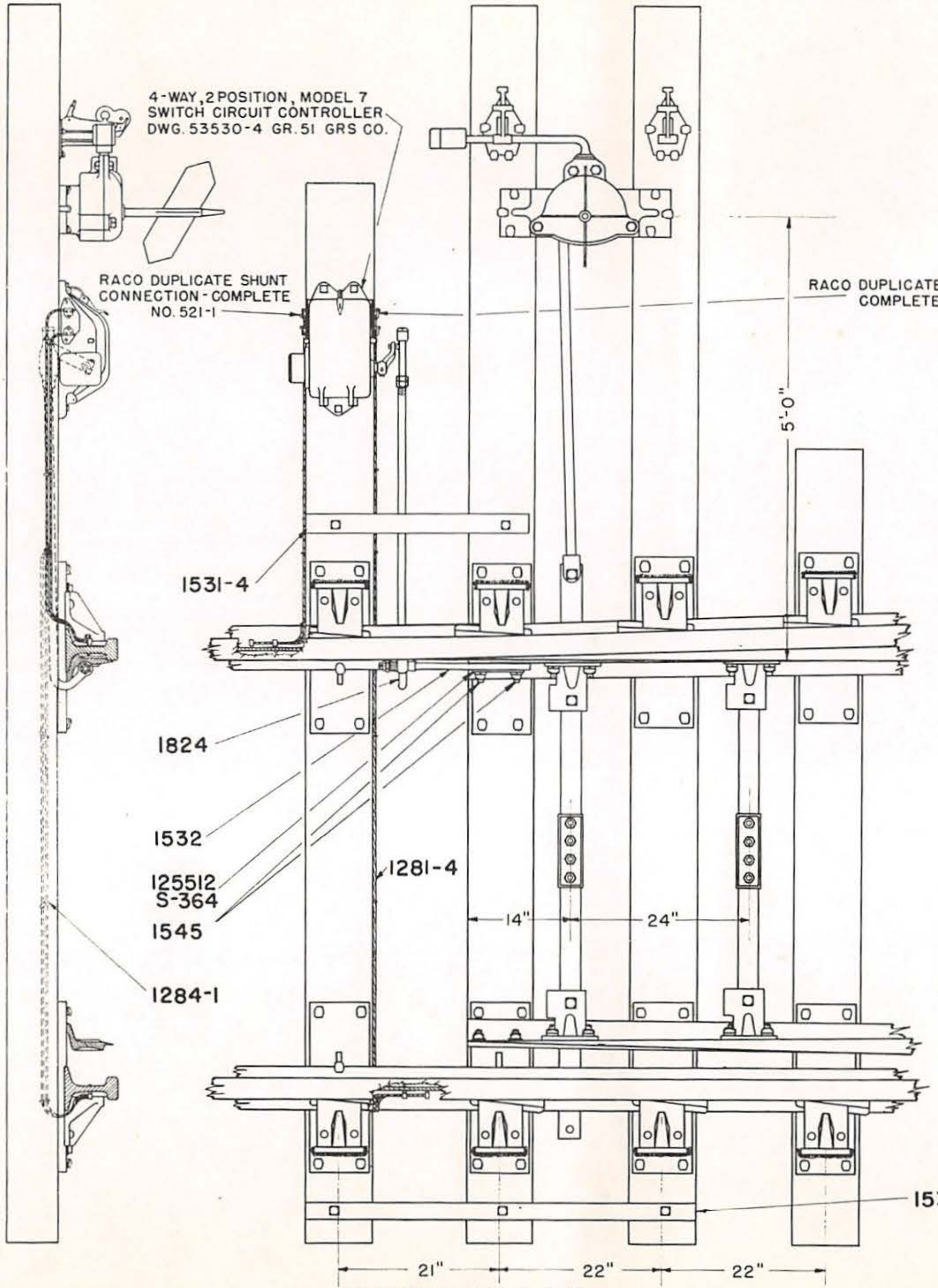
MATERIAL LIST FOR SWITCH LAYOUT USING MODEL 9 HAND OPERATED SWITCH MACHINE WITH MODEL 10 ELECTRIC LOCK AND TANDEM ARRANGEMENT

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

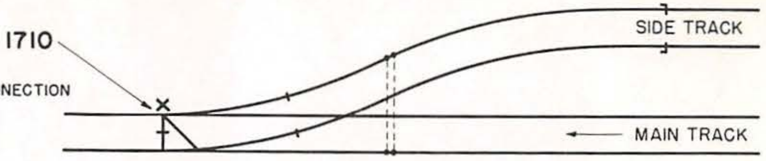
Sheet No.2

S-167-D

Made & Corrected: 9-6-52.
1-12-54: Adopted.
5-17-55: Items 6, 6A & 21 changed.
5-9-56: Rev.
6-27-58: Items 6b & 6c added.
1-13-59: 1532 & 1532-1 rev.


4-WAY, 2 POSITION, MODEL 7
SWITCH CIRCUIT CONTROLLER
DWG. 53530-4 GR. 51 GRS CO.
RACO DUPLICATE SHUNT
CONNECTION - COMPLETE
NO. 521-1
RACO DUPLICATE SHUNT CONNECTION
COMPLETE NO. 521-1.
5'-0"
1531-4
1824
1532
125512
S-364
1545
1281-4
1284-1
14"
24"
1531-1
21"
22"
22"

SINGLE SWITCH SHUNT - 1710


1710
SIDE TRACK
MAIN TRACK

LOCATION DIAGRAM
NO SCALE

NOTES:

1- USE FOULING BOND NO. 1281-4 AND CUT IN TWO PIECES TO FIT THE ARRANGEMENT SHOWN.

2- WHERE CADWELD SHUNT BONDS ARE IN SERVICE, USE OUTLET CAPS WITH BUSHINGS & CONNECTIONS, DWG. 56607-1 GR. 4 GRS CO.

3- STAPLES SHALL NOT BE DRIVEN NEAR TIE PLATES OR SPIKES.

APPROVED: ______
Chief Engineer

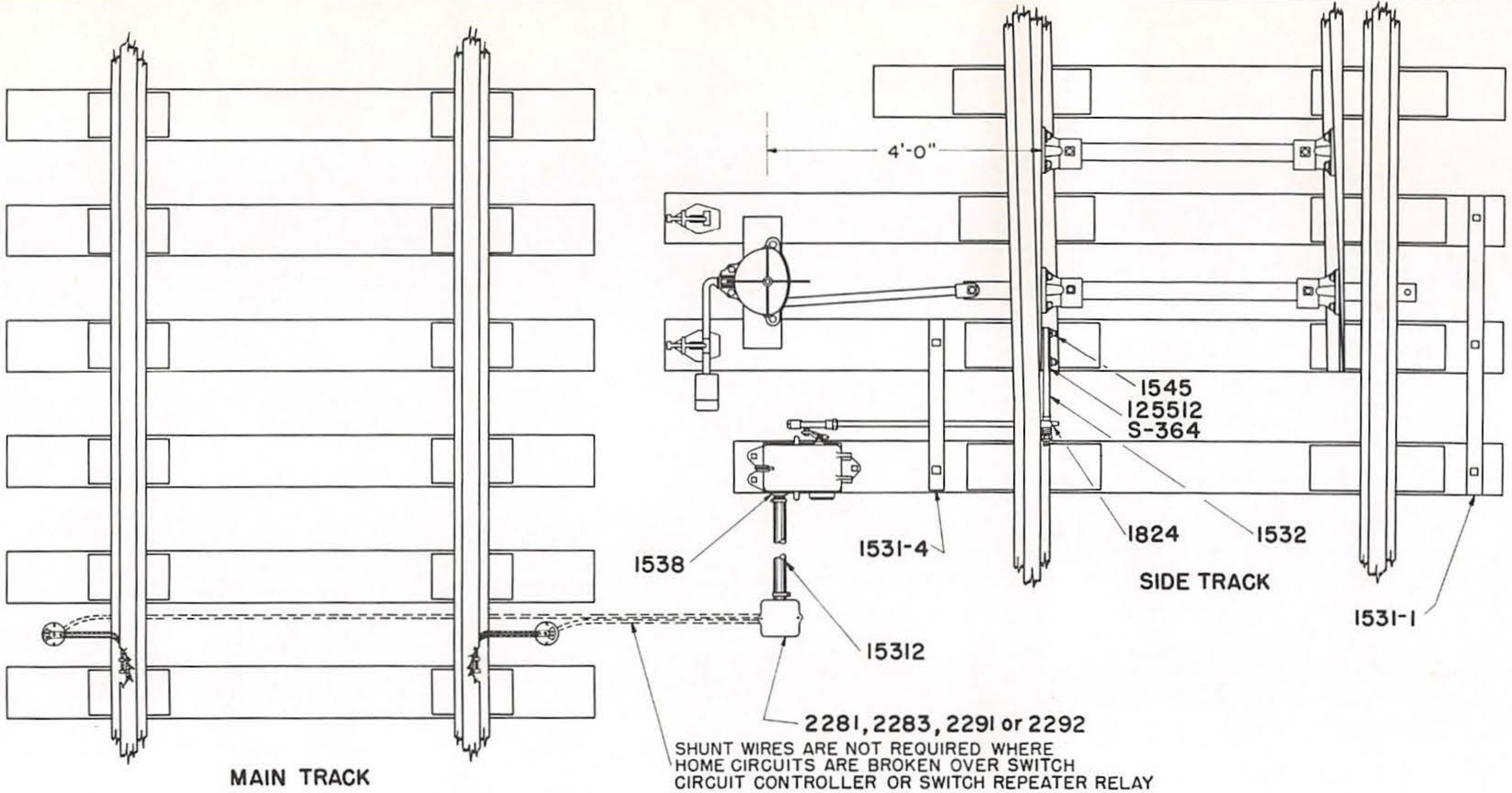
APPROVED: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
TRACK SHUNTING ARRANGEMENT
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

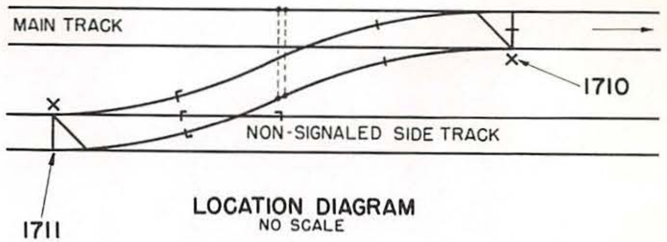
Sheet No. 1

S-171-C

Made & Corrected 11-12-48
Adopted 3-30-49.
9-20-50 Rev.
12-21-51 Large view of shunt connection removed.
1-13-59 1532 rev.


4'-0"
1545
125512
S-364
1538
1531-4
1824
1532
SIDE TRACK
1531-1
15312
2281, 2283, 2291 or 2292
MAIN TRACK

SHUNT WIRES ARE NOT REQUIRED WHERE HOME CIRCUITS ARE BROKEN OVER SWITCH CIRCUIT CONTROLLER OR SWITCH REPEATER RELAY


MAIN TRACK
1710
NON-SIGNALED SIDE TRACK
1711

LOCATION DIAGRAM
NO SCALE

NOTES:

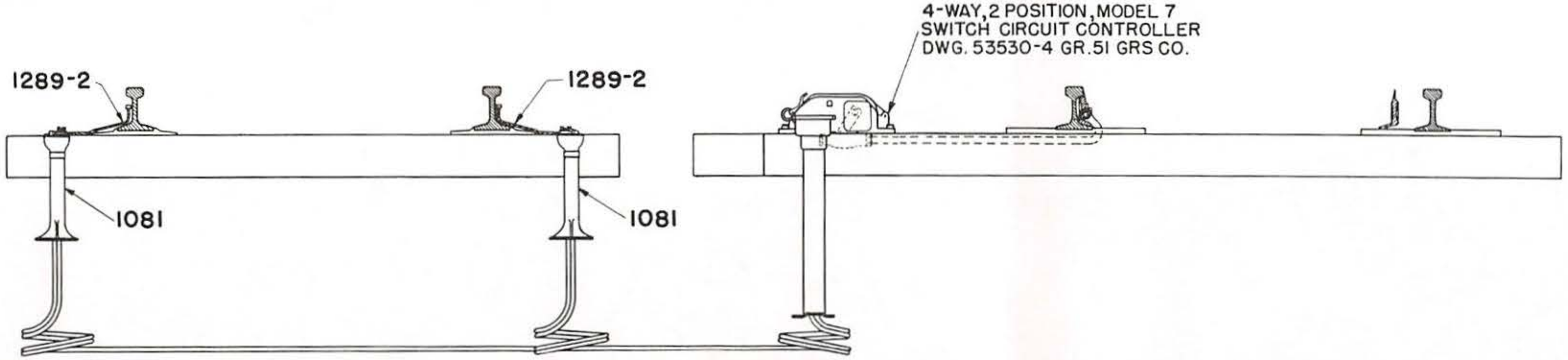
1-UNDERGROUND CABLE SHALL BE INSTALLED IN ACCORDANCE WITH CURRENT INSTRUCTIONS I-131.

2-NOT LESS THAN TWO CONTACTS OF EACH SWITCH CIRCUIT CONTROLLER SHALL BE CONNECTED IN MULTIPLE FOR SHUNTING EACH TRACK CIRCUIT. WHERE ADDITIONAL CONTACTS ARE REQUIRED FOR LINE CIRCUITS USE 6-WAY, 2-POSITION, MODEL 7 SWITCH CIRCUIT CONTROLLER DWG. 53530-9 GR. 12 & 16-WAY JUNCTION BOX DWG. 52918-11, FIG. 2 GRS CO.

3-WHERE LINE OR WP CIRCUITS ARE USED INSTEAD OF SHUNTING ARRANGEMENT SEE APPLICATION NO. 1714 FOR ARRANGEMENT OF SWITCH CIRCUIT CONTROLLER.

4-ALL WIRES BETWEEN SWITCH CIRCUIT CONTROLLER AND JUNCTION BOX SHALL BE NOT LESS THAN NO. 14 AWG. (19 STRAND) INSULATED COPPER WIRE.

5-ARRANGEMENT OF CIRCUITS FOR CROSSOVER BETWEEN SIGNALED TRACKS MUST BE REQUESTED FROM SIGNAL ENGINEER.


4-WAY, 2 POSITION, MODEL 7
SWITCH CIRCUIT CONTROLLER
DWG. 53530-4 GR. 51 GRS CO.
1289-2
1289-2
1081
1081

CROSSOVER SHUNT MAIN TO SIDING -1711

Approved: C.R. Riley
Chief Engineer

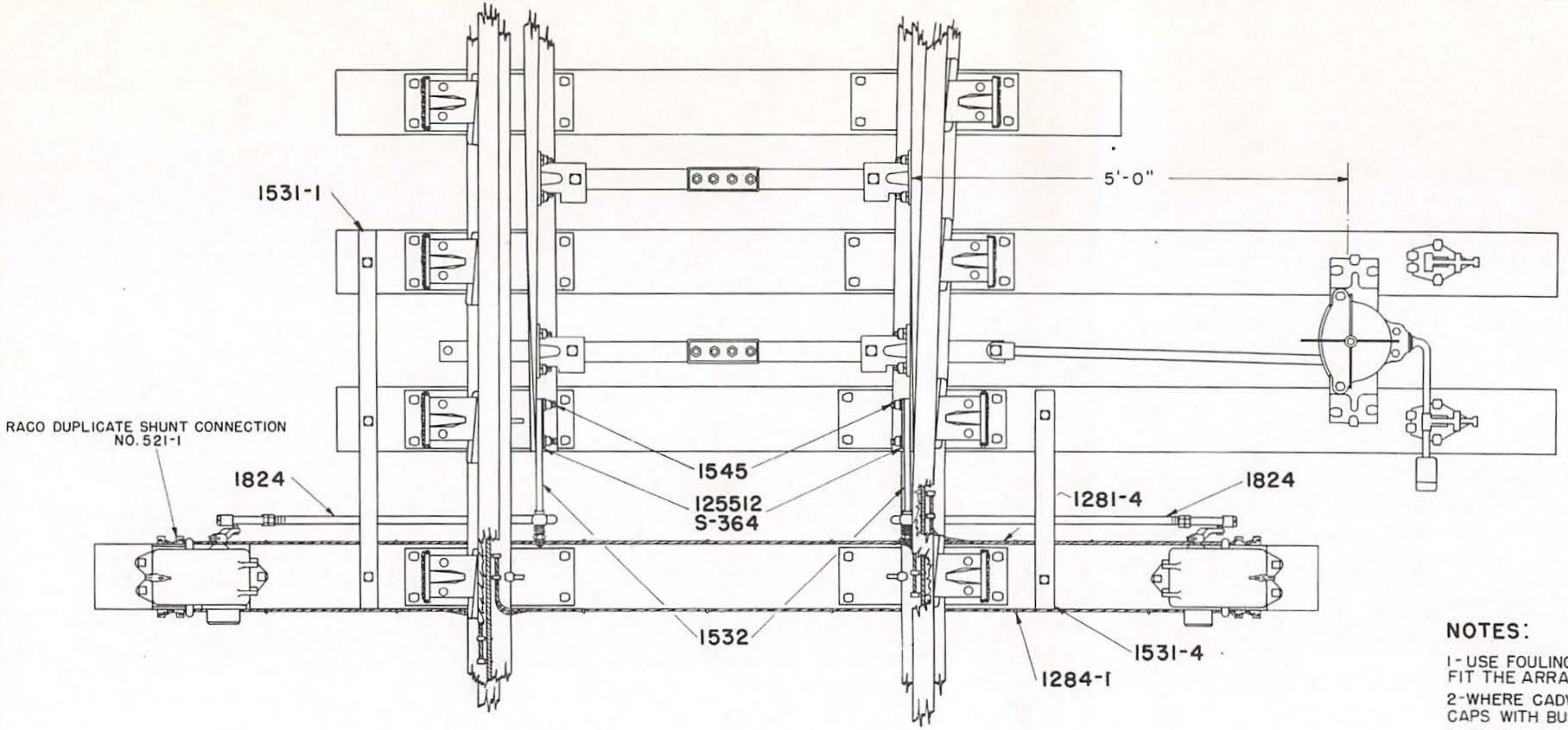
Approved: A.L. Jordan
Signal Engineer

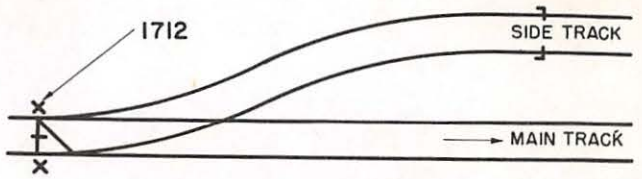
BALTIMORE & OHIO RAILROAD
TRACK SHUNTING ARRANGEMENT
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 2

S-171-C

Made & Corrected: 11-8-48.
Adopted: 3-30-49.
9-20-50: Ref. for hose changed.
12-21-51: Bond No. changed.
1-13-59: 1532 rev.


1531-1
5'-0"
RACO DUPLICATE SHUNT CONNECTION NO. 521-1
1824
1545
125512
S-364
1281-4
1824
1532
1531-4
1284-1


1712
SIDE TRACK
MAIN TRACK

LOCATION DIAGRAM
NO SCALE

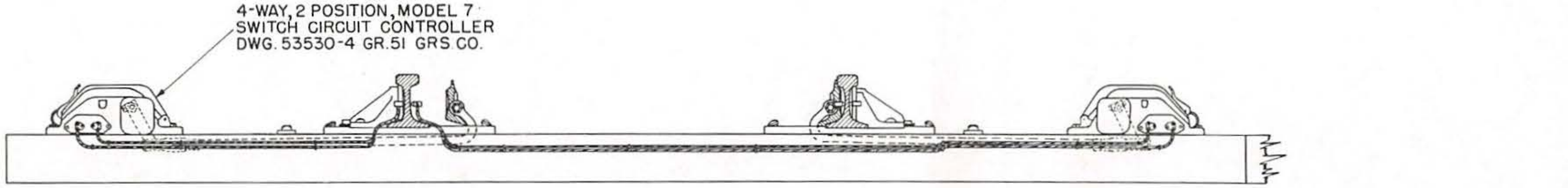
NOTES:

1- USE FOULING BOND NO.1281-4 AND CUT IN TWO PIECES TO FIT THE ARRANGEMENT SHOWN.

2-WHERE CADWELD SHUNT BONDS ARE IN SERVICE, USE OUTLET CAPS WITH BUSHINGS & CONNECTORS, DWG.56607-1 GR.4 GRS.CO.

3-STAPLES SHALL NOT BE DRIVEN NEAR TIE PLATES OR SPIKES.

4-WHERE LINE OR WP CIRCUITS ARE USED INSTEAD OF SHUNTING ARRANGEMENT SEE APPLICATION NO.1714 FOR ARRANGEMENT OF SWITCH CIRCUIT CONTROLLER.


4-WAY, 2 POSITION, MODEL 7 SWITCH CIRCUIT CONTROLLER DWG. 53530-4 GR.51 GRS CO.

FACING SWITCH SHUNT-1712

Approved: C Riley
Chief Engineer

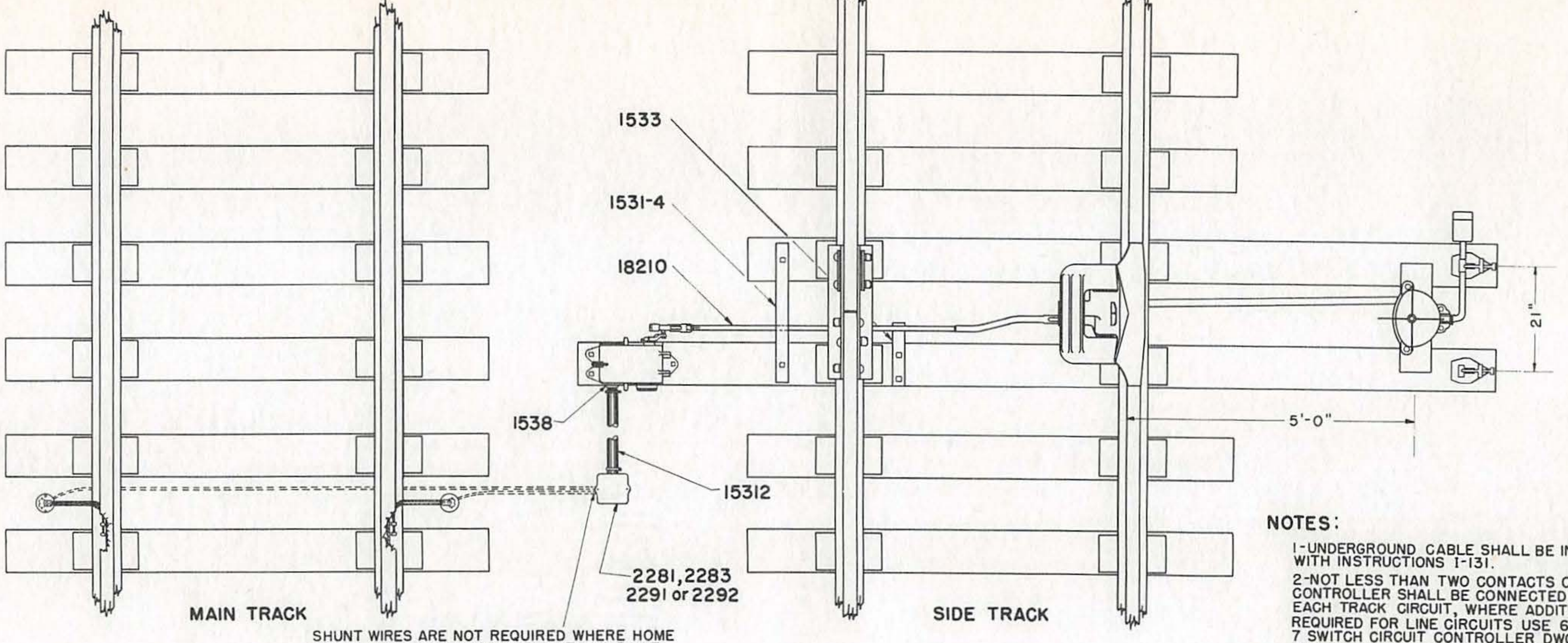
Approved: A L Jordan
Signal Engineer

Made & Corrected 12-7-48.
Adopted 3-30-49.
9-20-50 Rev.
12-21-51 Bond numbering changed.
1-13-59 1532 rev.

BALTIMORE & OHIO RAILROAD
TRACK SHUNTING ARRANGEMENT
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 3

S-171-C


1533
1531-4
18210
1538
15312
2281,2283
2291 or 2292
21"
5'-0"
MAIN TRACK
SIDE TRACK

SHUNT WIRES ARE NOT REQUIRED WHERE HOME CIRCUITS ARE BROKEN OVER SWITCH CIRCUIT CONTROLLER OR SWITCH REPEATER RELAY.

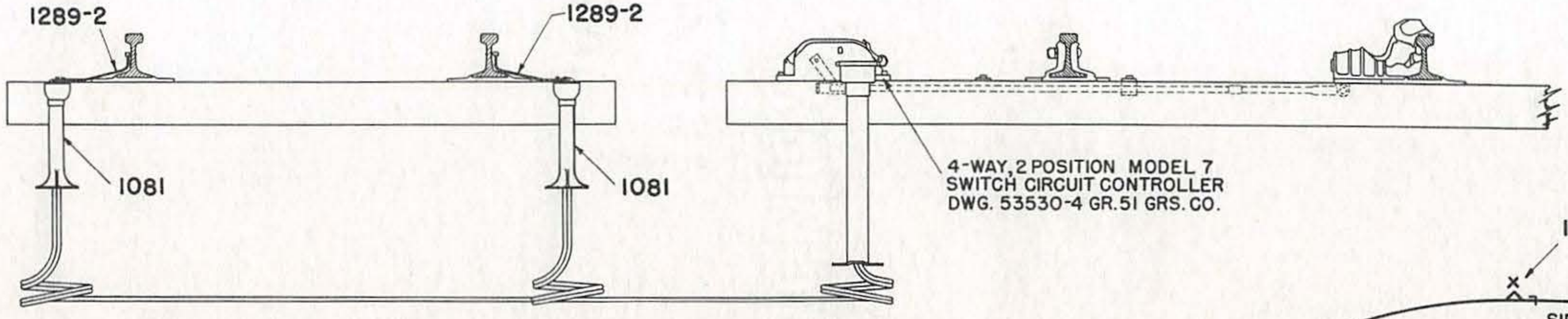
NOTES:

1-UNDERGROUND CABLE SHALL BE INSTALLED IN ACCORDANCE WITH INSTRUCTIONS I-131.

2-NOT LESS THAN TWO CONTACTS OF EACH SWITCH CIRCUIT CONTROLLER SHALL BE CONNECTED IN MULTIPLE FOR SHUNTING EACH TRACK CIRCUIT, WHERE ADDITIONAL CONTACTS ARE REQUIRED FOR LINE CIRCUITS USE 6-WAY, 2-POSITION, MODEL 7 SWITCH CIRCUIT CONTROLLER DWG. 53530-9 GR.12 & 16-WAY JUNCTION BOX DWG. 52918-11, FIG. 2 GRS CO.

3-WHERE LINE OR WP CIRCUITS ARE USED INSTEAD OF SHUNTING ARRANGEMENT SEE APPLICATION NO. 1714 FOR ARRANGEMENT OF SWITCH CIRCUIT CONTROLLER.

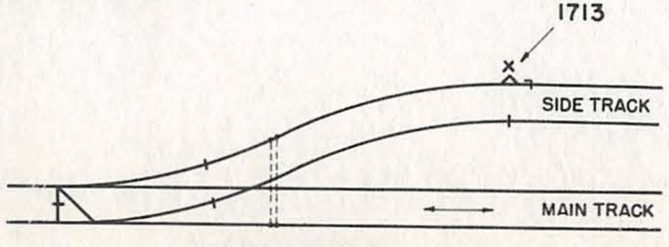
4-ALL WIRES BETWEEN SWITCH CIRCUIT CONTROLLER AND JUNCTION BOX SHALL BE NOT LESS THAN NO. 14 AWG (19 STRAND) INSULATED COPPER WIRE.


1289-2
1289-2
1081
1081
4-WAY, 2 POSITION MODEL 7
SWITCH CIRCUIT CONTROLLER
DWG. 53530-4 GR. 51 GRS. CO.

LIFT TYPE DERAIL SHUNT - 1713

APPROVED: ______
CHIEF ENG'R. MAINTENANCE

APPROVED: ______
CHIEF ENG'R. COMM. & SIGS.


1713
SIDE TRACK
MAIN TRACK

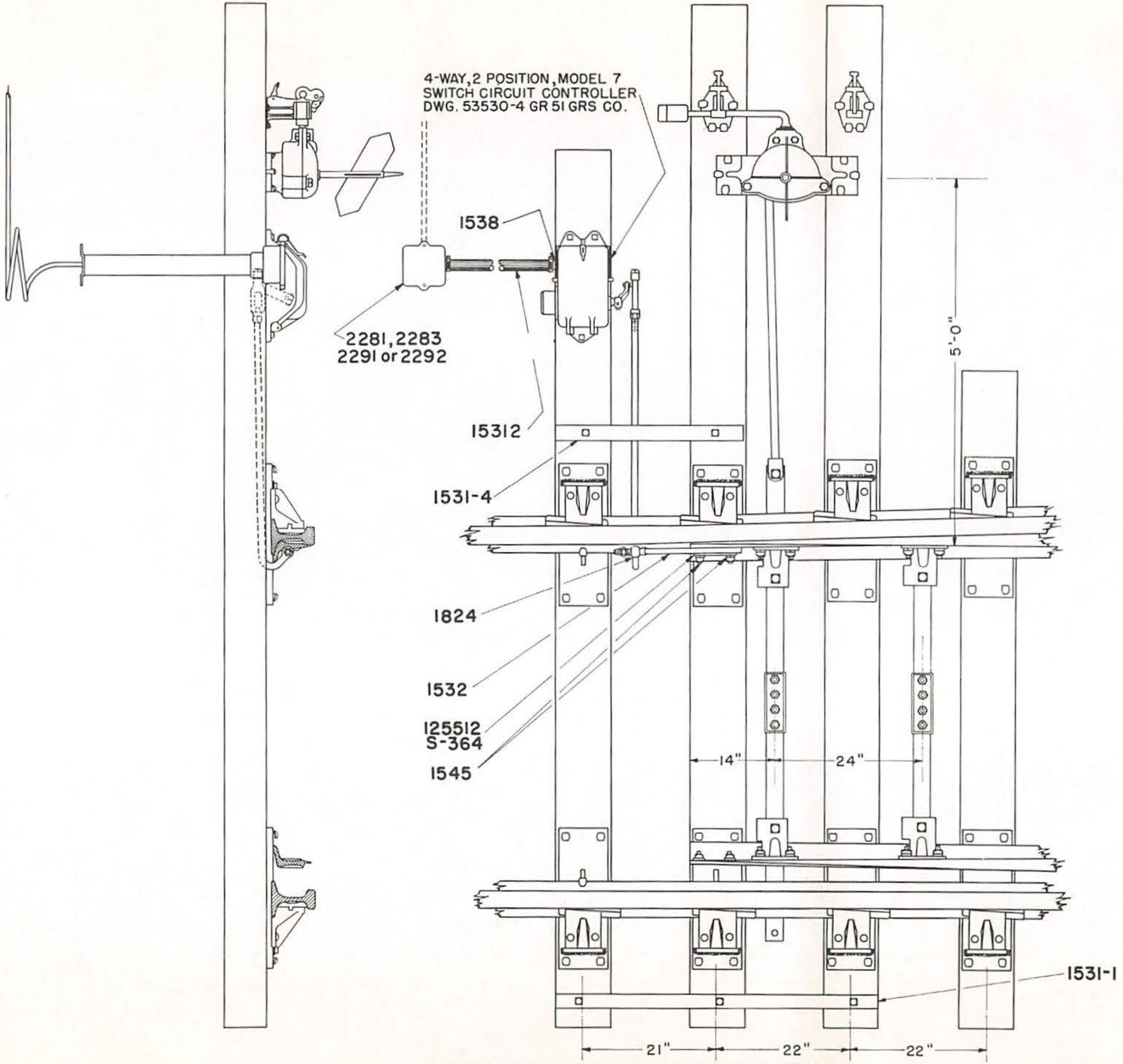
LOCATION DIAGRAM
NO SCALE

BALTIMORE & OHIO RAILROAD
TRACK SHUNTING ARRANGEMENT
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
NOV. 22, 1948

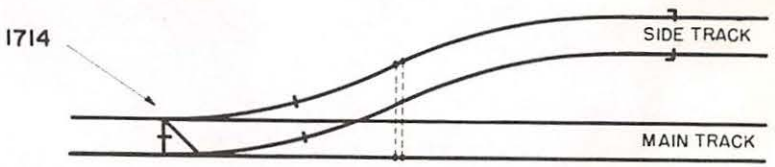
ADOPTED: 3-30-49
Revised 9-20-50 account ref. for hose changed.
Revised 12-24-51 account changing circuit controller.

SHEET NO. 4

S-171-B


4-WAY, 2 POSITION, MODEL 7
SWITCH CIRCUIT CONTROLLER
DWG. 53530-4 GR 51 GRS CO.
1538
2281, 2283
2291 or 2292
15312
1531-4
1824
1532
125512
S-364
1545
5'-0"
14"
24"
1531-1
21"
22"
22"

SWITCH CIRCUIT CONTROLLER ARRANGEMENT-1714


1714
SIDE TRACK
MAIN TRACK

LOCATION DIAGRAM
NO SCALE

NOTES:

1- CABLE SHALL BE INSTALLED IN ACCORDANCE WITH CURRENT INSTRUCTIONS I-131.

2- SUBSTITUTE 6-WAY CIRCUIT CONTROLLER AND 16-WAY JUNCTION BOX WHERE NEEDED.

3- ALL WIRES BETWEEN SWITCH CIRCUIT CONTROLLER AND JUNCTION BOX SHALL BE NOT LESS THAN NO. 14 AWG. (19 STRAND) INSULATED COPPER WIRE.

Approved: Riley
Chief Engineer

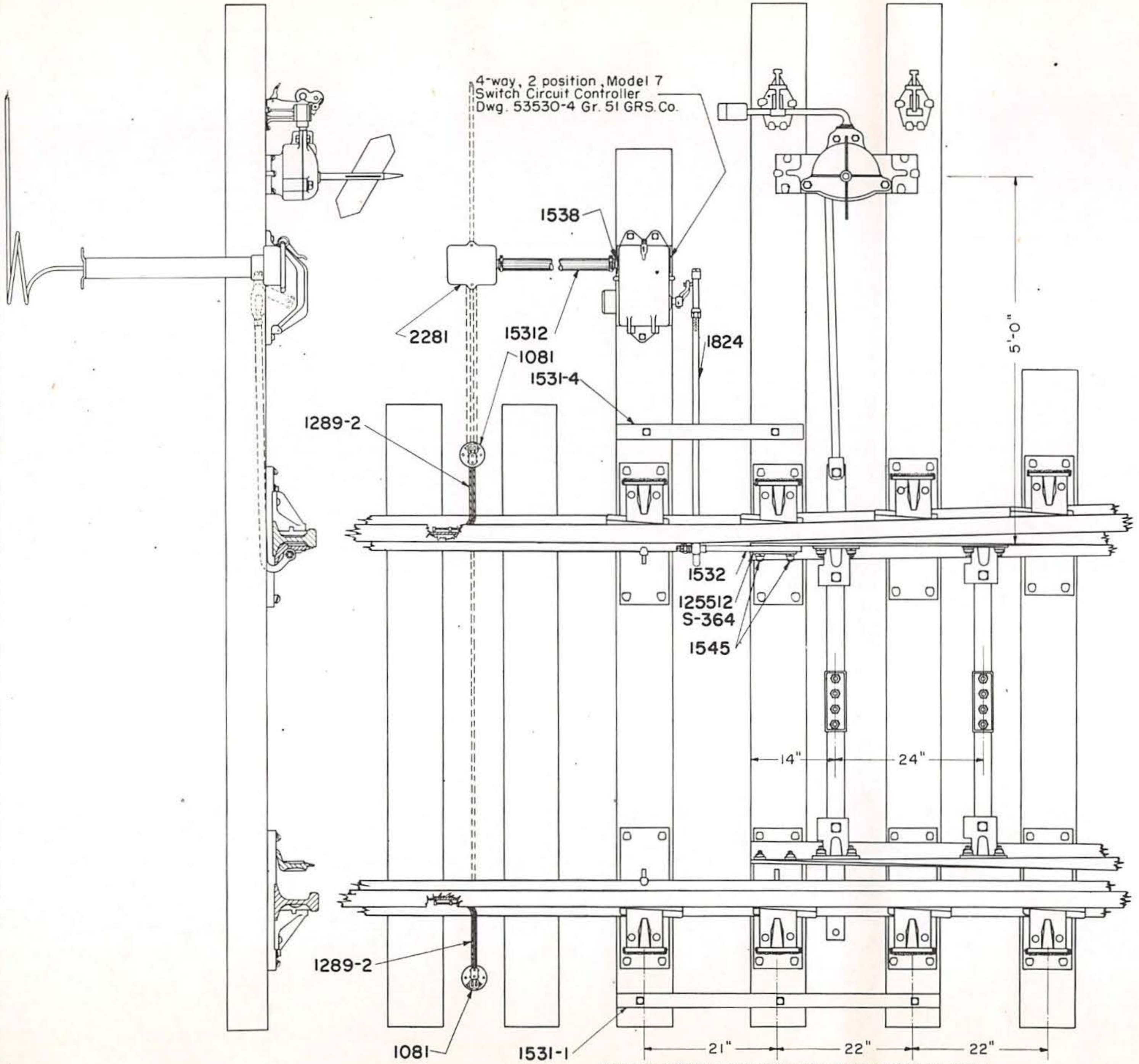
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWITCH CIRCUIT CONTROLLER ARRANGEMENT
FOR LINE OR WP CIRCUITS
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

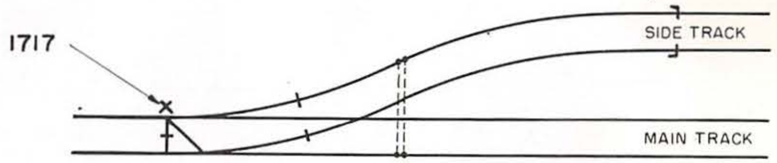
Sheet No. 5

S-171-C

Made & Corrected: 11-30-48.
Adopted: 3-30-49.
9-20-50: Ref. for hose changed.
12-26-51: No. 2281 added.
1-13-59: 1532 rev.


4-way, 2 position, Model 7
Switch Circuit Controller
Dwg. 53530-4 Gr. 51 GRS. Co.
1538
2281
15312
1081
1531-4
1824
1289-2
5'-0"
1532
125512
S-364
1545
14"
24"
1289-2
1081
1531-1
21"
22"
22"

SWITCH CIRCUIT CONTROLLER ARRANGEMENT-1717


1717
SIDE TRACK
MAIN TRACK

LOCATION DIAGRAM
NO SCALE

Notes:

1- Cable shall be installed in accordance with current instructions I-131.

2- Substitute 6-way circuit controller and 16-way junction box where needed.

3- All wires between switch circuit controller and junction box shall be not less than No.14 AWG. (19 Strand) insulated copper wire.

Approved: C.R. Riley
Chief Engineer

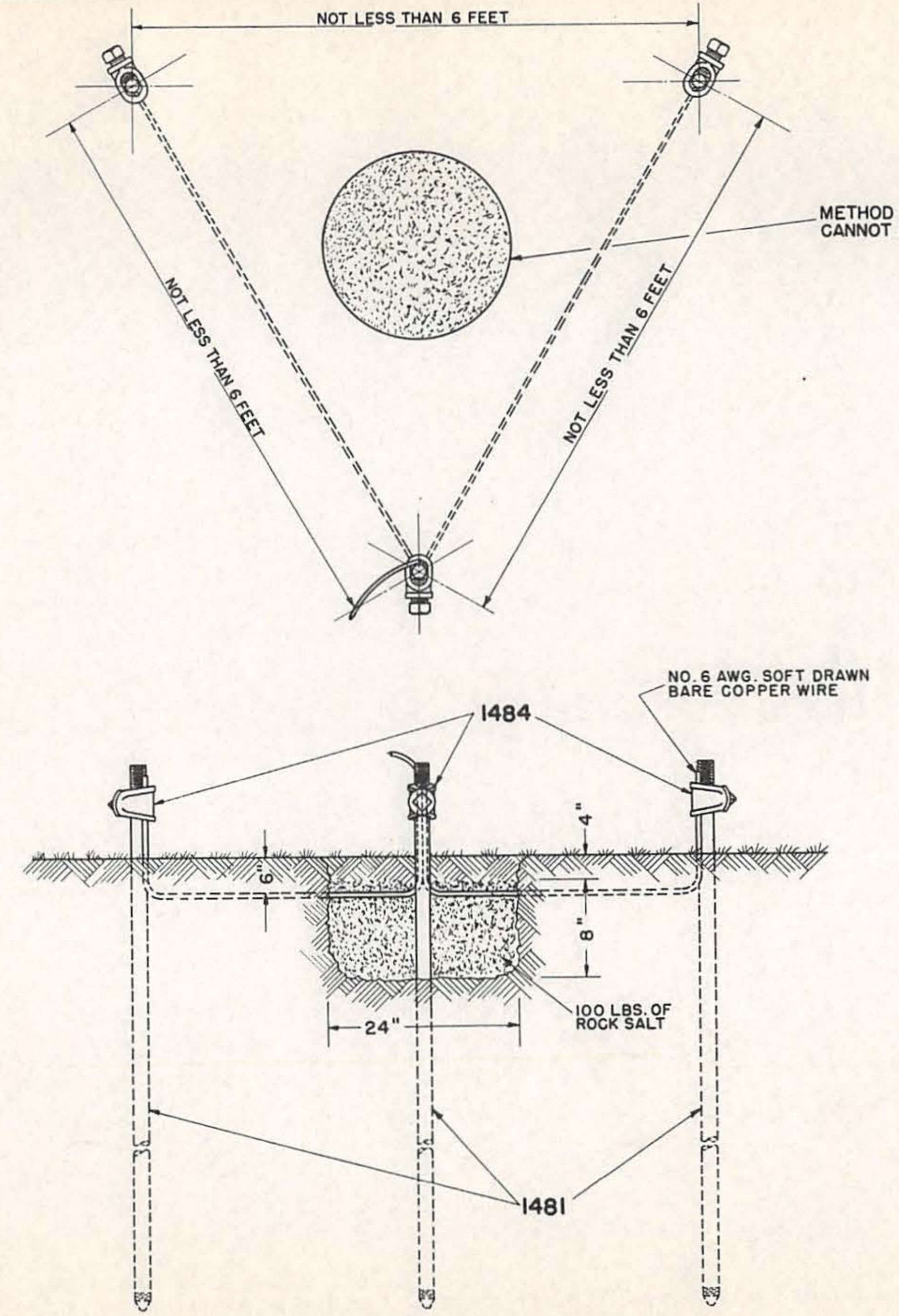
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
SWITCH CIRCUIT CONTROLLER ARRANGEMENT FOR LINE AND TRACK SHUNTING CIRCUITS
Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

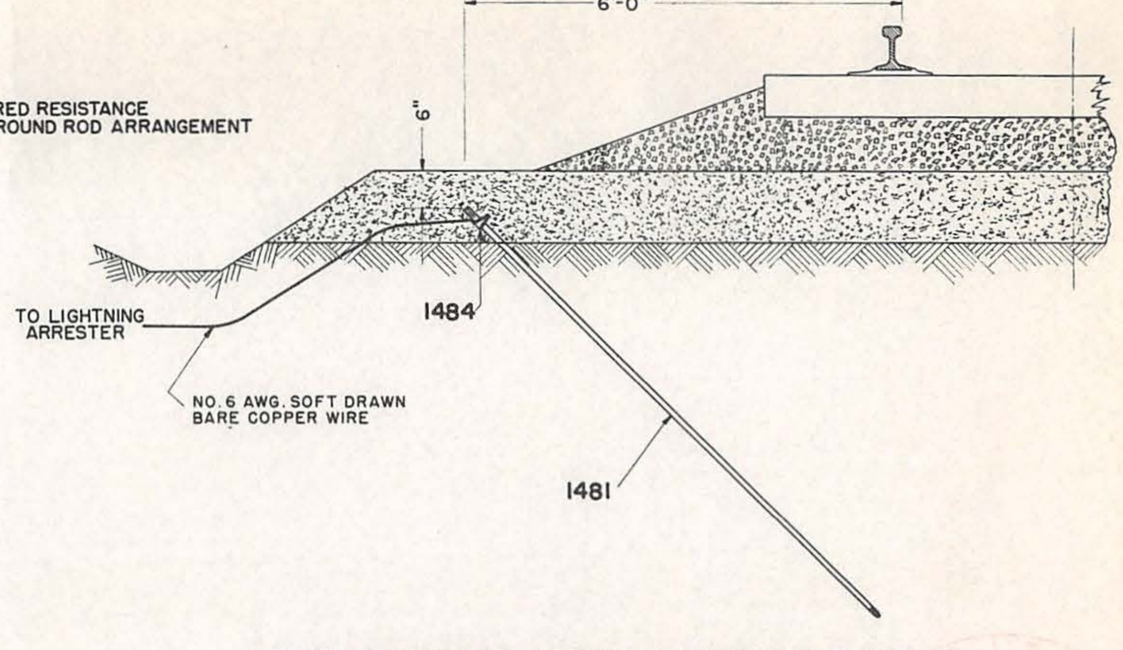
Sheet No. 6

S-171-C

1-3-52-New Plan Made.
11-18-52-Adopted.
1-13-59-1532 rev.


NOT LESS THAN 6 FEET
NOT LESS THAN 6 FEET
NOT LESS THAN 6 FEET
METHOD OF SOIL TREATMENT WHEN DESIRED RESISTANCE CANNOT BE OBTAINED WITH MULTIPLE GROUND ROD ARRANGEMENT
NO. 6 AWG. SOFT DRAWN BARE COPPER WIRE
1484
4"
6"
8"
24"
100 LBS. OF ROCK SALT
1481

ARRANGEMENT OF MULTIPLE GROUND RODS


6'-0"
6"
TO LIGHTNING ARRESTER
1484
NO. 6 AWG. SOFT DRAWN BARE COPPER WIRE
1481

METHOD OF INSTALLING GROUND ROD BENEATH TRACK

NOTES:

GROUND RODS SHALL BE INSTALLED IN ACCORDANCE WITH INSTRUCTIONS FOR LIGHTNING ARRESTER GROUNDS I-117

APPROVED: ______________
CHIEF ENG'R. MAINTENANCE

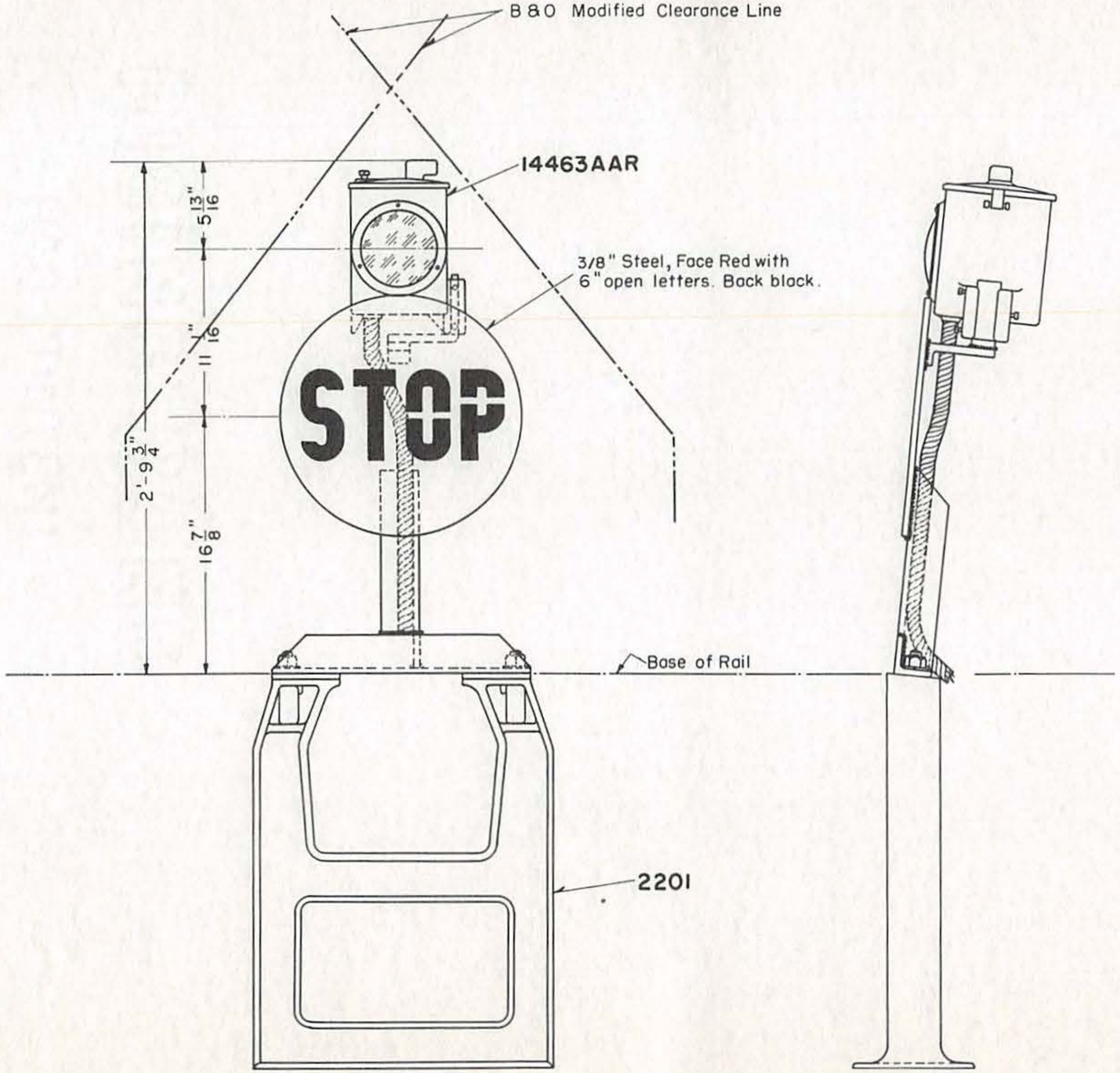
APPROVED: ______________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
SPECIAL
GROUND ROD ARRANGEMENTS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
APRIL 14, 1949

SHEET NO. 1
S-172

ADOPTED: 3-30-49.

RECEIVED
AUG 8 1949
SPECIFICATION DEPT.


B & O Modified Clearance Line
14463AAR
3/8" Steel, Face Red with 6" open letters. Back black.
STOP
5 13/16"
11 1/16"
16 7/8"
2'-9 3/4"
Base of Rail
2201

Notes:

Place 300 feet each side of Railroad Grade Crossing, where trains must come to full stop and may be used at other approved locations.

Face of sign to be painted Signal Red. Back of sign Black.

Lamp to be equipped with red lens.

Sign to be used only where conditions prevent the use of sign S-176.

When Commercial Power is available use Electric Lamp shown as Item 1, Signal Standard Plan S-113-B.

When Commercial Power is not available use Edison Carbonaire Battery 2-S-J-1 or equal, with 2.9V.-.150 Amp. S C Bayonet Base S-8 clear lamp bulb, G.E. Company.

Approved: ______
Chief Eng'r. Maintenance

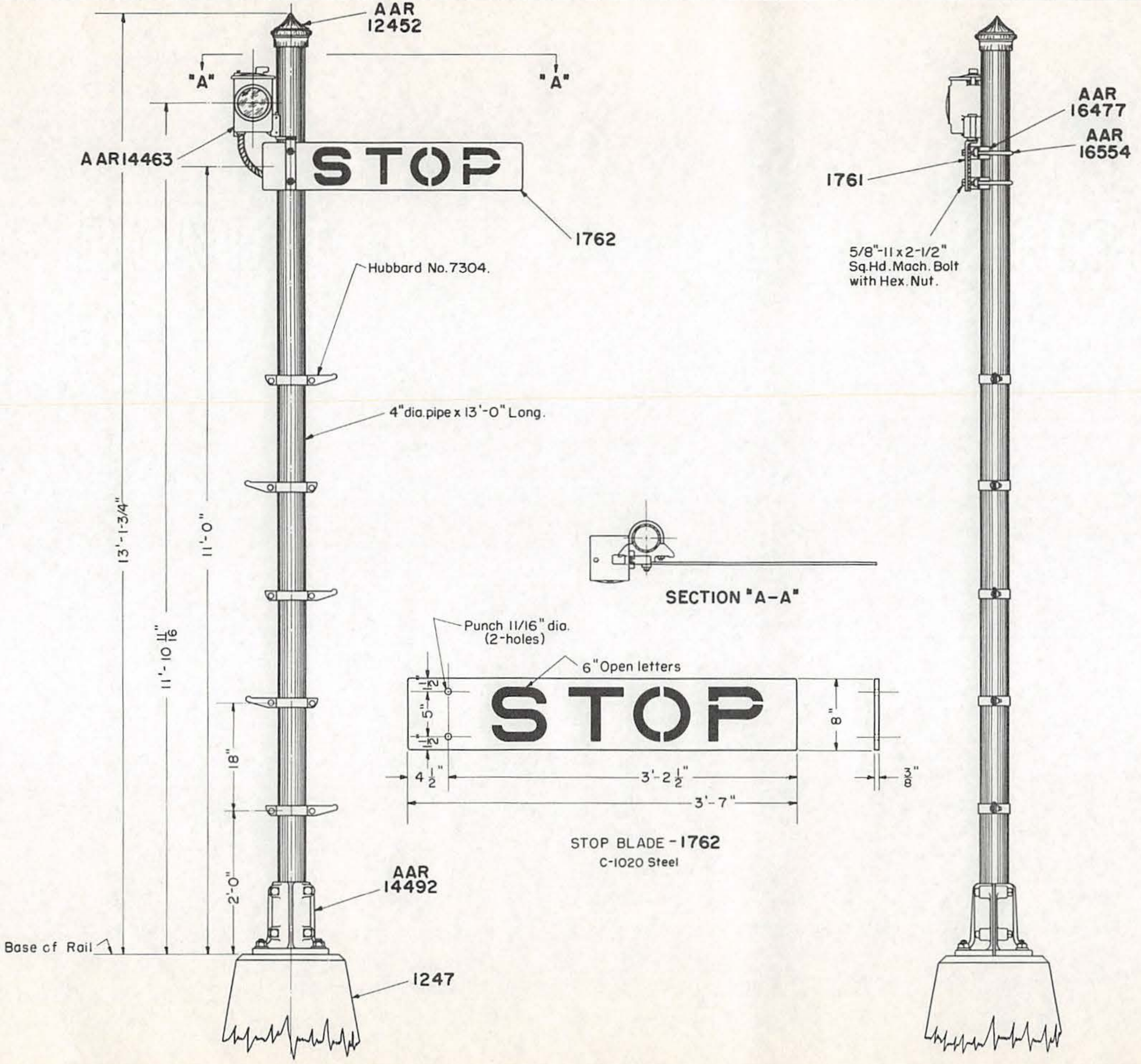
Approved: ______
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
DWARF STOP SIGN
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 12, 1951

Adopted: 5-16-51.

Sheet No. 1

S-174


AAR 12452
"A"
"A"
AAR14463
STOP
1762
Hubbard No.7304.
4" dia. pipe x 13'-0" Long.
13'-1-3/4"
11'-0"
11'-10 11/16
18"
2'-0"
AAR 14492
Base of Rail
1247
SECTION "A-A"
Punch 11/16" dia. (2-holes)
6" Open letters
STOP
1/2
5"
1/2
8"
4 1/2"
3'-2 1/2"
3'-7"
3/8"
AAR 16477
AAR 16554
1761
5/8"-11 x 2-1/2" Sq.Hd. Mach. Bolt with Hex. Nut.

STOP BLADE - 1762
C-1020 Steel

NOTES:

Place 300 feet each side of Railroad Grade Crossing, where trains must come to full stop and may be used at other approved locations.

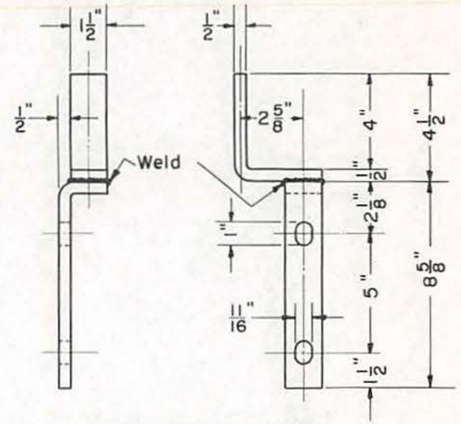
Face of sign to be painted Signal Red. Back of sign and mast Black.

Lamp to be equipped with red lens.

Sign must not be closer to gauge of near rail than 7'-2" Standard 9'-8-1/4" center line of mast to center line of track.

When Commercial Power is available use Electric Lamp shown as Item 1, Signal Standard Plan S-113-B.

When Commercial Power is not available use Edison Carbonaire Battery 2-S-J-1 or equal, with 2.9V.-.150 Amp. SC Bayonet Base S-8 clear lamp bulb, G.E. Company.


1 1/2"
1/2"
1/2"
Weld
2 5/8"
4"
4 1/2"
1/2"
2 1/8"
1"
5"
8 5/8"
11/16"
1 1/2"

LAMP BRACKET - 1761
C-1020 Steel

Approved: ____________
Chief Eng'r. Maintenance

Approved: ____________
Chief Eng'r. Comm. & Sigs.

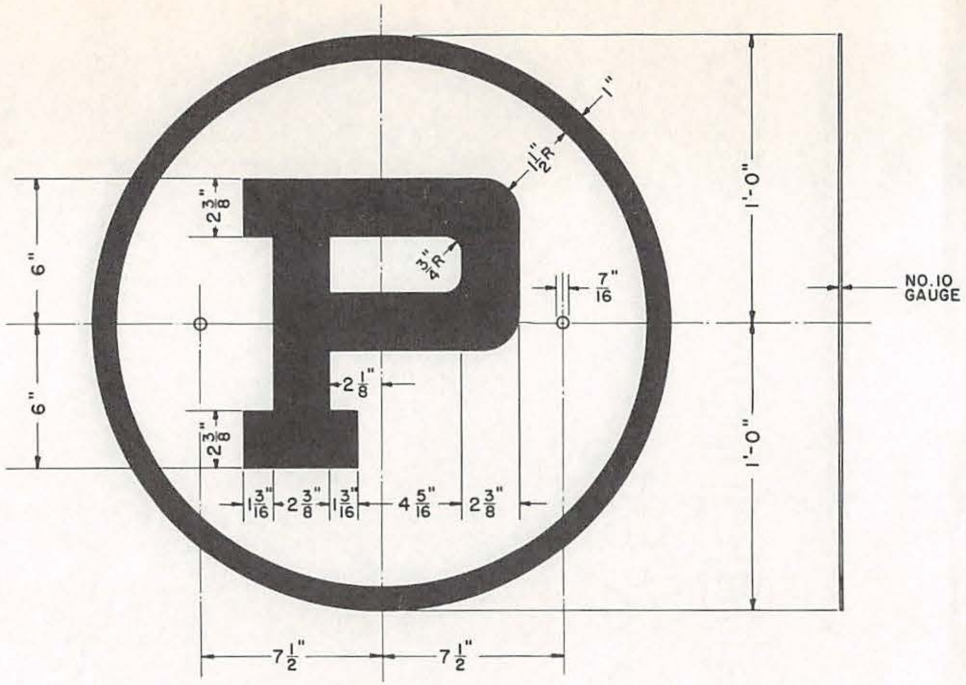
BALTIMORE & OHIO RAILROAD

STOP SIGN

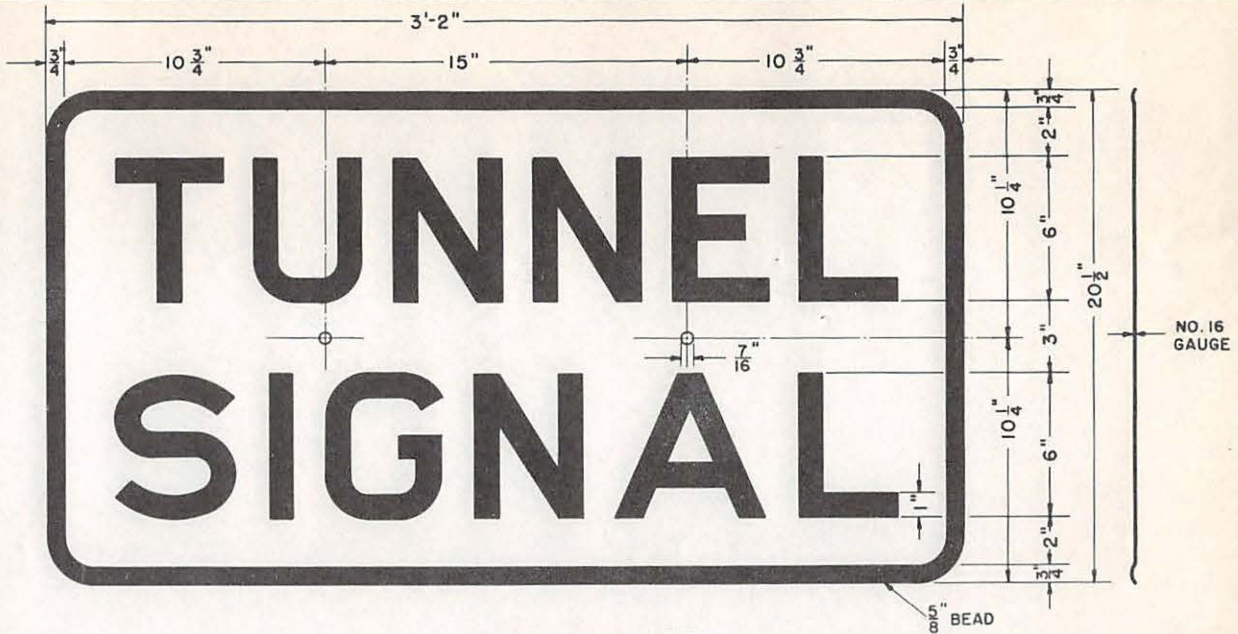
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
April 6, 1951.

S-176-A

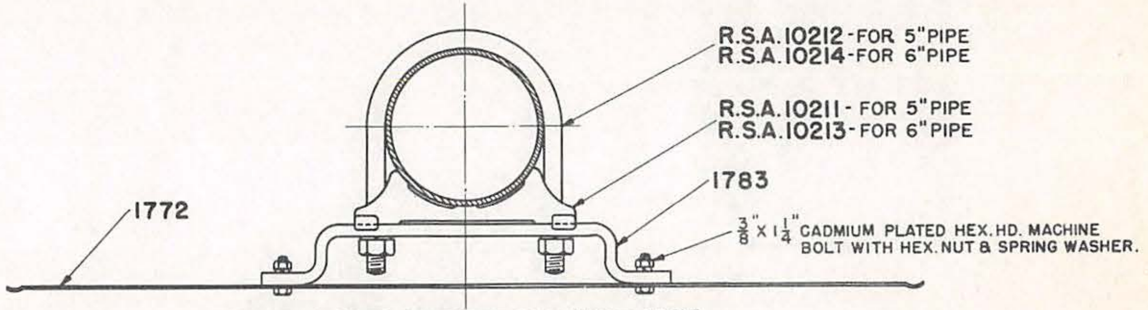
Adopted: 5-16-51
2-29-52: Stop Blade shown.


1"
1½" R
¾" R
2⅜"
6"
6"
2⅜"
2⅛"
7/16"
1'-0"
1'-0"
NO. 10 GAUGE
1 3/16"
2⅜"
1 3/16"
4 5/16"
2⅜"
7½"
7½"

GRADE MARKER DISC - 1771

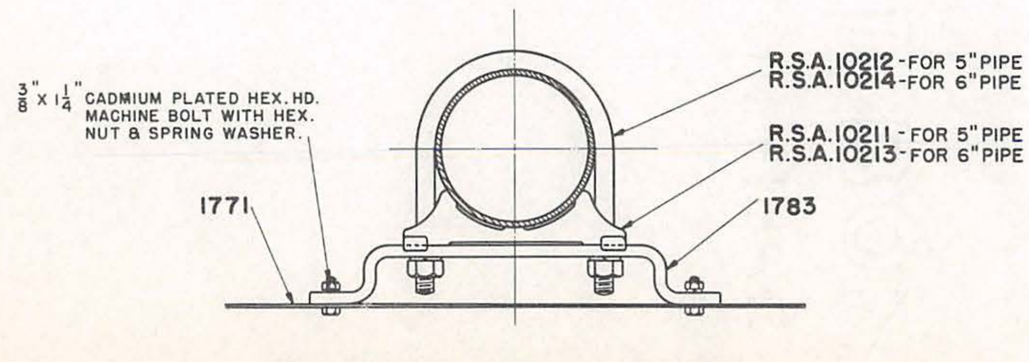

3'-2"
¾"
10¾"
15"
10¾"
¾"
TUNNEL
SIGNAL
7/16"
1"
¾"
2"
10¼"
6"
3"
10¼"
6"
2"
¾"
20½"
NO. 16 GAUGE
⅝" BEAD

TUNNEL MARKER - 1772


R.S.A. 10212 - FOR 5" PIPE
R.S.A. 10214 - FOR 6" PIPE
R.S.A. 10211 - FOR 5" PIPE
R.S.A. 10213 - FOR 6" PIPE
1783
1772
⅜" x 1¼" CADMIUM PLATED HEX. HD. MACHINE BOLT WITH HEX. NUT & SPRING WASHER.

TUNNEL MARKER COMPLETE FOR 5" PIPE - 1775

TUNNEL MARKER COMPLETE FOR 6" PIPE - 1776


⅜" x 1¼" CADMIUM PLATED HEX. HD. MACHINE BOLT WITH HEX. NUT & SPRING WASHER.
R.S.A. 10212 - FOR 5" PIPE
R.S.A. 10214 - FOR 6" PIPE
R.S.A. 10211 - FOR 5" PIPE
R.S.A. 10213 - FOR 6" PIPE
1771
1783

GRADE MARKER COMPLETE FOR 5" PIPE - 1773

GRADE MARKER COMPLETE FOR 6" PIPE - 1774

NOTE:

GRADE MARKER

DISC TO BE MADE OF NO. 10 GAUGE OPEN HEARTH STEEL AND ENAMELED WITH NOT LESS THAN THREE (3) COATS OF VITREOUS ENAMEL.

LETTER "P" TO BE SOLID BLACK ON WHITE BACKGROUND. EDGES, BORDER AND BACK TO BE BLACK.

TUNNEL MARKER

SIGN TO BE MADE OF NO. 16 GAUGE STEEL WITH 5/8 INCH BEADED EDGES.

LETTERS TO BE PAINTED SOLID BLACK ON WHITE BACKGROUND, EDGES, BORDER AND BACK TO BE PAINTED BLACK.

SIGN WILL BE ORDERED BY LETTER TO CHIEF ENGINEER MAINTENANCE AND WILL BE FURNISHED BY MT. CLARE SIGN SHOP.

APPROVED: ____________
CHIEF ENG'R. MAINTENANCE

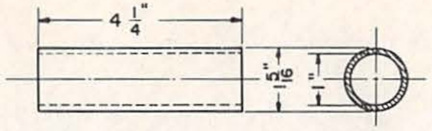
APPROVED: ____________
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
GRADE AND TUNNEL MARKERS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 9, 1949

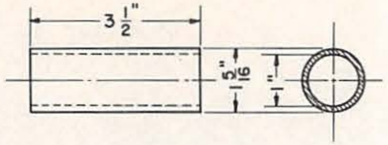
3-30-49 REDRAWN SUPSEDES PLANS A25-1A & A25-1B.

S-177

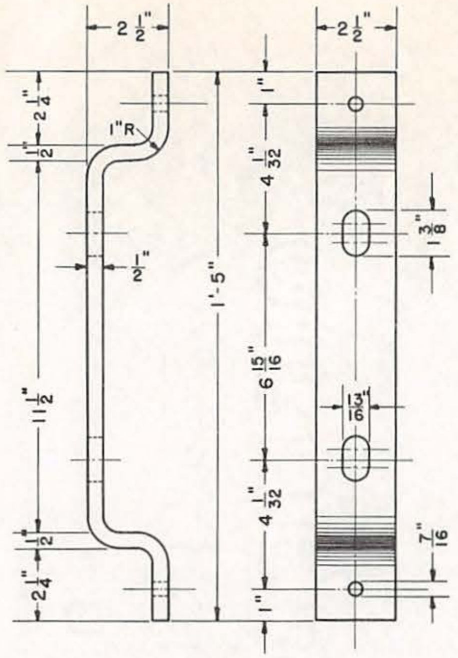
RECEIVED
MAY 28 1949
SPECIFICATION DEPT.



I" PIPE SEPARATOR - 1781

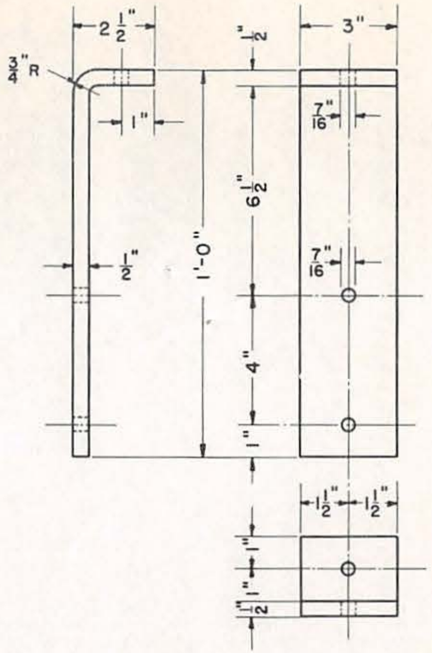


I" PIPE SEPARATOR - 1782



2 1/2"
2 1/2"
1"R
2 1/4"
1/2"
1/2"
11 1/2"
1/2"
2 1/4"
1'-5"
1"
4 1/32"
6 15/16"
4 1/32"
1"
1 3/8"
13/16"
7/16"

BRACKET - 1783



3/4"R
2 1/2"
1"
1/2"
1/2"
3"
1'-0"
6 1/2"
4"
1"
7/16"
7/16"
1 1/2"
1 1/2"
1"
1"
1/2"

BRACKET - 1784

APPROVED: ______ CHIEF ENG'R. MAINTENANCE

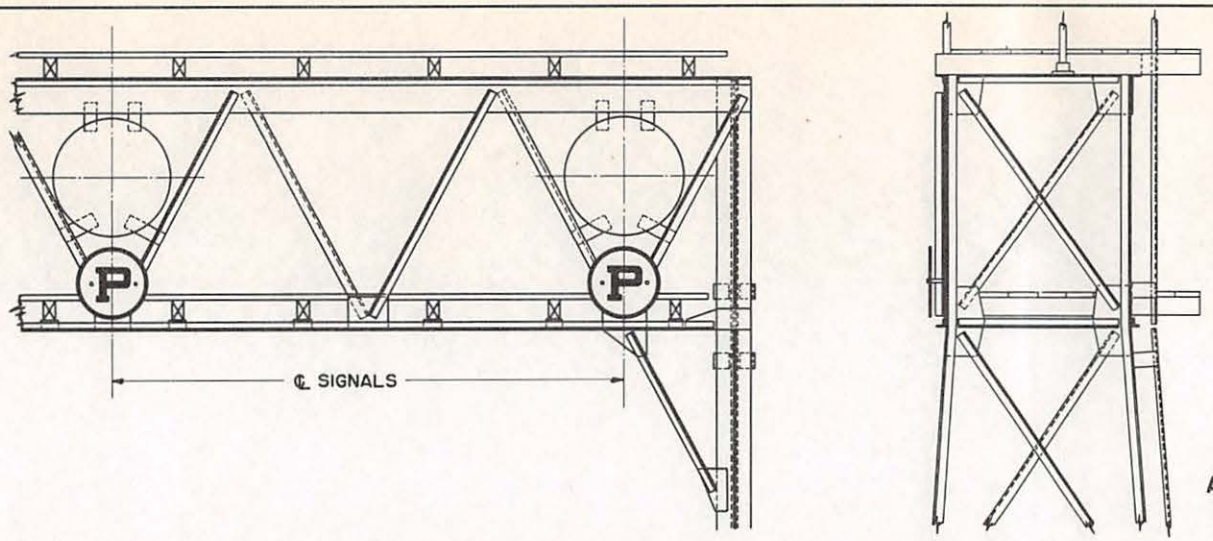
APPROVED: ______ CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
MARKER FITTINGS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 15, 1949

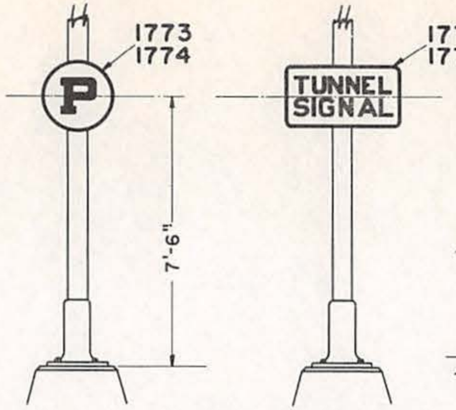
3-30-49 REDRAWN SUPERSEDES PARTS SHOWN ON PLANS A25-1A & A25-1C.

S-178

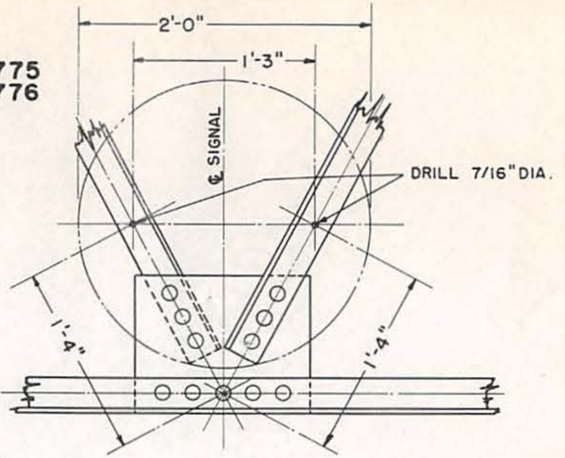
SPECIFICATION DEPT.
RECEIVED
MAY 23 1949
7 8 9 10 11 12 1 2 3 4 5 6

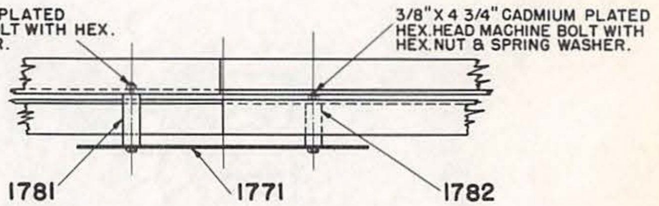


APPLICATION TO SIGNAL BRIDGE

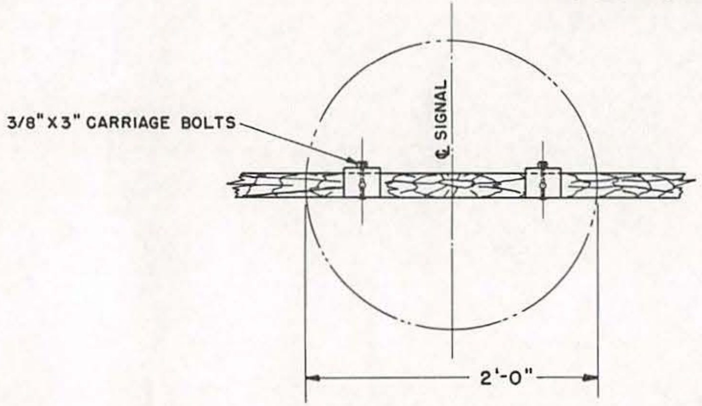

1773
1774
P
1775
1776
TUNNEL
SIGNAL
7'-6"

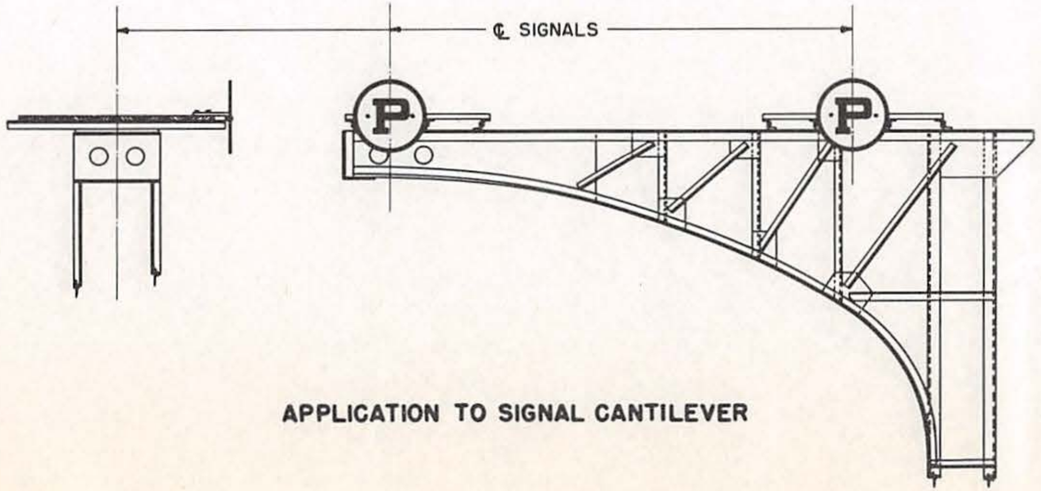
APPLICATION TO GROUND SIGNAL MASTS


2'-0"
1'-3"
℄ SIGNAL
DRILL 7/16" DIA.
1'-4"
1'-4"

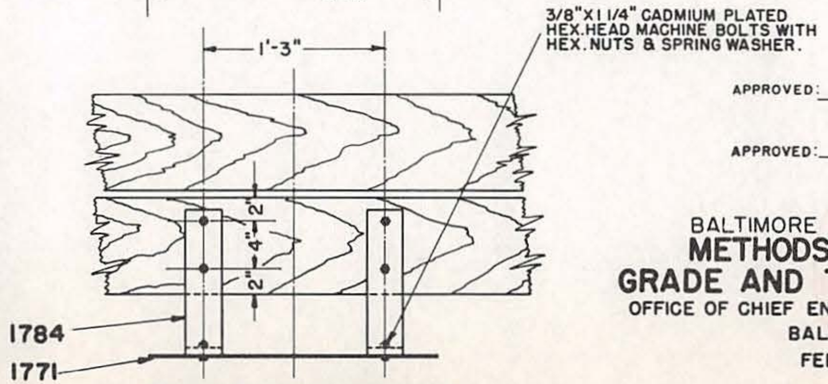

3/8" X 5 1/2" CADMIUM PLATED HEX. HEAD MACHINE BOLT WITH HEX. NUT & SPRING WASHER.
3/8" X 4 3/4" CADMIUM PLATED HEX. HEAD MACHINE BOLT WITH HEX. NUT & SPRING WASHER.
1781
1771
1782

ENLARGED VIEW SHOWING
APPLICATION TO SIGNAL BRIDGE


3/8" X 3" CARRIAGE BOLTS
℄ SIGNAL
2'-0"



APPLICATION TO SIGNAL CANTILEVER


3/8" X 1 1/4" CADMIUM PLATED HEX. HEAD MACHINE BOLTS WITH HEX. NUTS & SPRING WASHER.
1'-3"
2"
4"
2"
1784
1771

ENLARGED VIEW SHOWING
APPLICATION TO SIGNAL CANTILEVER

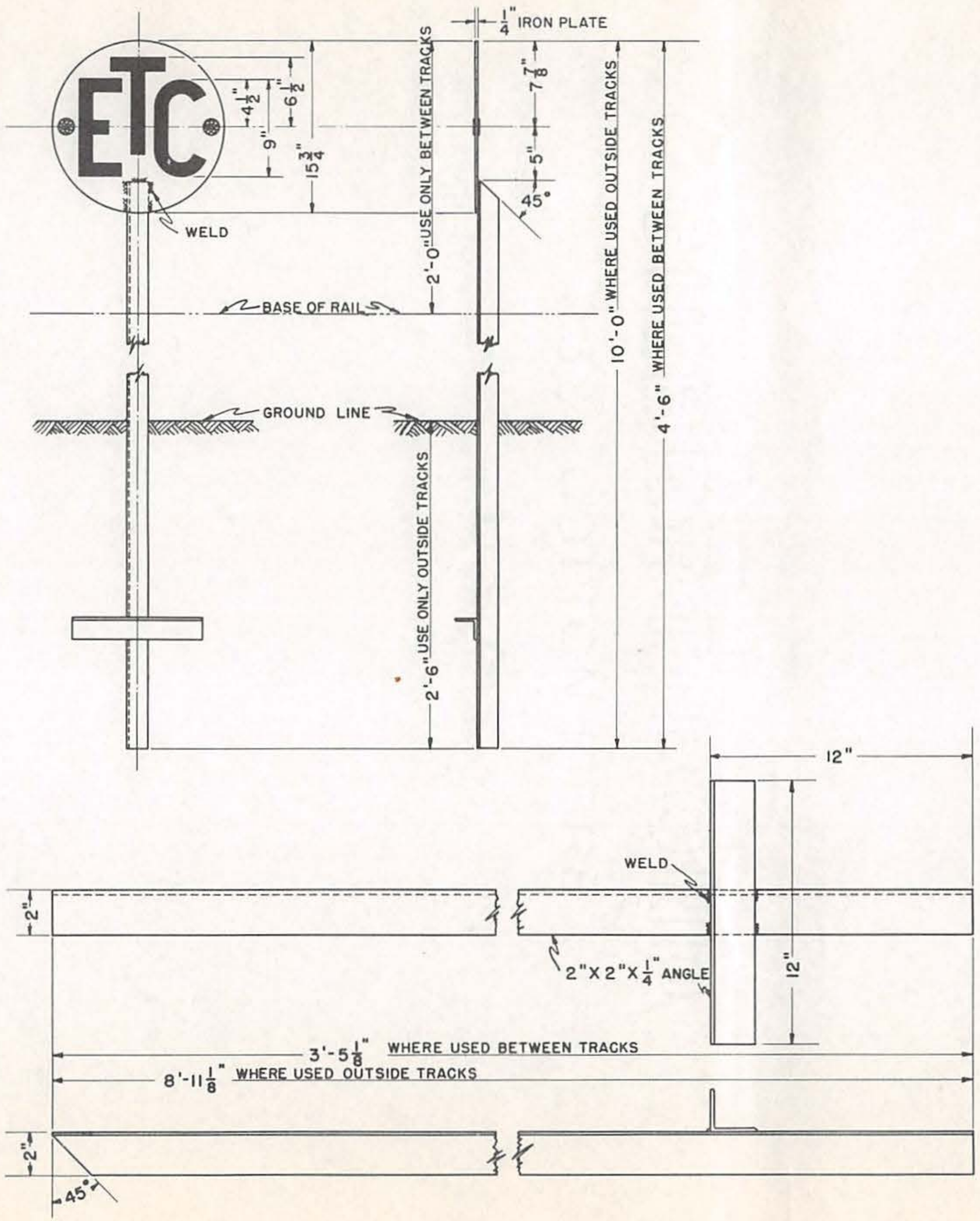
APPROVED: CHIEF ENG'R. MAINTENANCE

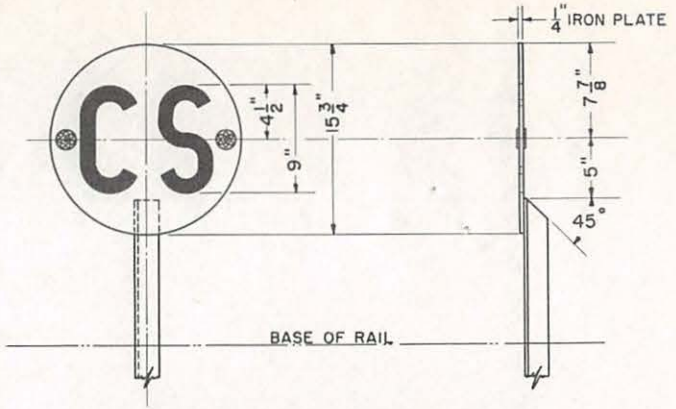
APPROVED: CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
METHODS OF APPLYING
GRADE AND TUNNEL MARKERS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
FEB. 10, 1949

3-30-49 REDRAWN SUPSEDES PLANS
A25-1A & A25-1C.

S-179


ETC
1/4" IRON PLATE
4 1/2"
6 1/2"
9"
15 3/4"
7 7/8"
5"
45°
WELD
2'-0" USE ONLY BETWEEN TRACKS
10'-0" WHERE USED OUTSIDE TRACKS
4'-6" WHERE USED BETWEEN TRACKS
BASE OF RAIL
GROUND LINE
2'-6" USE ONLY OUTSIDE TRACKS
12"
WELD
2"
2"X2"X1/4" ANGLE
12"
3'-5 1/8" WHERE USED BETWEEN TRACKS
8'-11 1/8" WHERE USED OUTSIDE TRACKS
2"
45°


CS
1/4" IRON PLATE
4 1/2"
15 3/4"
9"
7 7/8"
5"
45°
BASE OF RAIL

END OF TRACK CIRCUIT SIGN COMPLETE

SIGN FOR USE BETWEEN TRACKS - 1801
SIGN FOR USE OUTSIDE TRACKS - 1802

CUT SECTION SIGN COMPLETE

(USED ONLY ON SPECIAL INSTRUCTIONS)
SIGN FOR USE BETWEEN TRACKS - 1803
SIGN FOR USE OUTSIDE TRACKS - 1804

NOTE:

SIGNS TO BE USED ONLY AT LOCATIONS SPECIFIED ON OFFICE OF CHIEF ENGINEER, COMMUNICATIONS AND SIGNALS DRAWINGS AND IN GENERAL ORDER CONCERNING THE PLACING OF CIRCUITS IN SERVICE.

SIGNS 1801 - 1803

FACE OF SIGN TO BE PAINTED WHITE

BACK OF SIGN AND POST PAINTED WHITE

1 5/8" DIAMETER STIMSONITE CRYSTAL REFLECTORS TO BE MOUNTED ON FRONT AND BACK OF SIGN.

LETTERS TO BE 1 1/4" WIDE CONDENSED "OPEN TYPE LETTERS"

SIGNS 1802 - 1803

FACE OF SIGN TO BE PAINTED WHITE.

BACK OF SIGN AND POST PAINTED BLACK.

LETTERS TO BE 1 1/4" WIDE CONDENSED "OPEN TYPE LETTERS"

SIGN MOUNTED ON ENGINEMAN'S RIGHT 7'-2" FROM GAUGE OF RAIL.

APPROVED: ____________________
CHIEF ENG'R. MAINTENANCE

APPROVED: ____________________
CHIEF ENG'R. COMM. & SIGS.

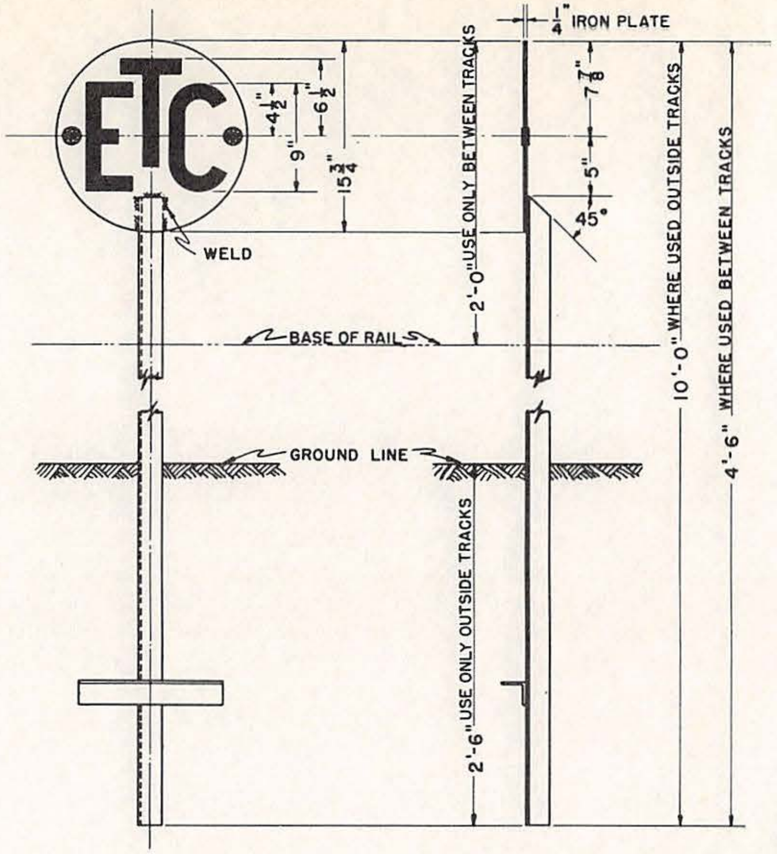
BALTIMORE & OHIO RAILROAD

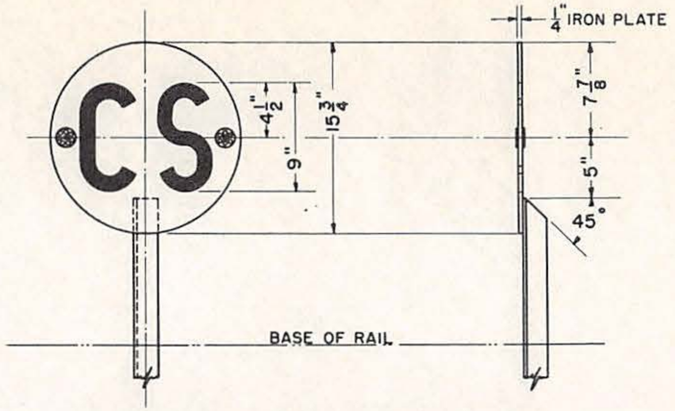
END OF TRACK CIRCUIT AND CUT SECTION SIGNS

OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 2, 1949

S-180

3-30-49 REDRAWN & REFLECTOR CHANGED.
SUPERSEDES PLAN A25-ID.


ETC
1/4" IRON PLATE
4 1/2"
6 1/2"
9"
15 3/4"
7 7/8"
5"
45°
WELD
2'-0" USE ONLY BETWEEN TRACKS
10'-0" WHERE USED OUTSIDE TRACKS
4'-6" WHERE USED BETWEEN TRACKS
BASE OF RAIL
GROUND LINE
2'-6" USE ONLY OUTSIDE TRACKS

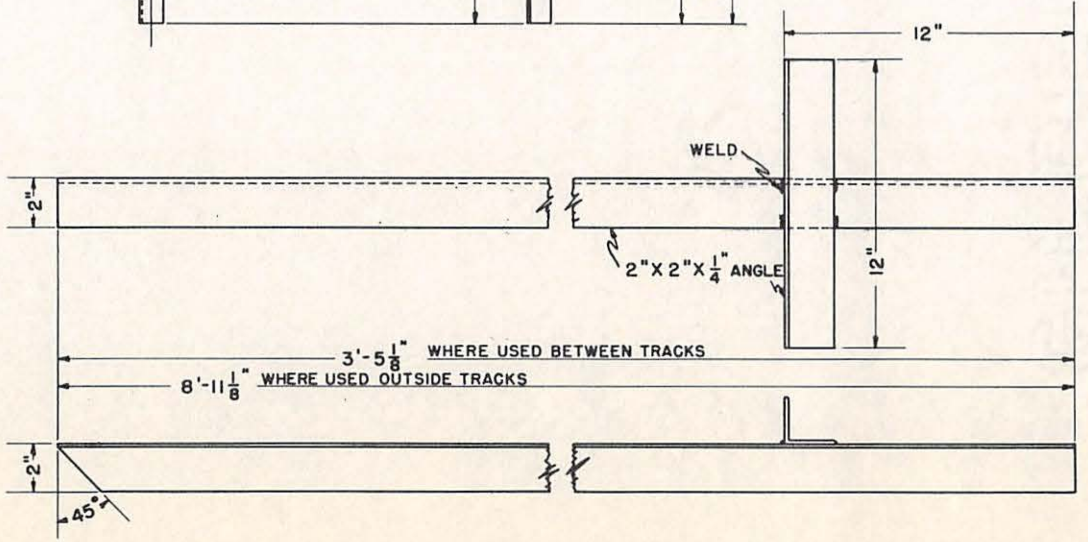

CS
1/4" IRON PLATE
4 1/2"
9"
15 3/4"
7 7/8"
5"
45°
BASE OF RAIL

END OF TRACK CIRCUIT SIGN COMPLETE

SIGN FOR USE BETWEEN TRACKS - 1801
SIGN FOR USE OUTSIDE TRACKS - 1802

CUT SECTION SIGN COMPLETE

(USED ONLY ON SPECIAL INSTRUCTIONS)
SIGN FOR USE BETWEEN TRACKS - 1803
SIGN FOR USE OUTSIDE TRACKS - 1804


12"
WELD
2"
12"
2"X2"X1/4" ANGLE
3'-5 1/8" WHERE USED BETWEEN TRACKS
8'-11 1/8" WHERE USED OUTSIDE TRACKS
2"
45°

NOTE:

SIGNS TO BE USED ONLY AT LOCATIONS SPECIFIED ON OFFICE OF CHIEF ENGINEER, COMMUNICATIONS AND SIGNALS DRAWINGS AND IN GENERAL ORDER CONCERNING THE PLACING OF CIRCUITS IN SERVICE.

SIGNS 1801 - 1803
FACE OF SIGN TO BE PAINTED WHITE
BACK OF SIGN AND POST PAINTED WHITE
1 5/8" DIAMETER STIMSONITE CRYSTAL REFLECTORS TO BE MOUNTED ON FRONT AND BACK OF SIGN.
LETTERS TO BE 1 1/4" WIDE CONDENSED "OPEN TYPE LETTERS"

SIGNS 1802 - 1804
FACE OF SIGN TO BE PAINTED WHITE.
BACK OF SIGN AND POST PAINTED BLACK.
LETTERS TO BE 1 1/4" WIDE CONDENSED "OPEN TYPE LETTERS"
SIGN MOUNTED ON ENGINEMAN'S RIGHT 7'-2" FROM GAUGE OF RAIL.

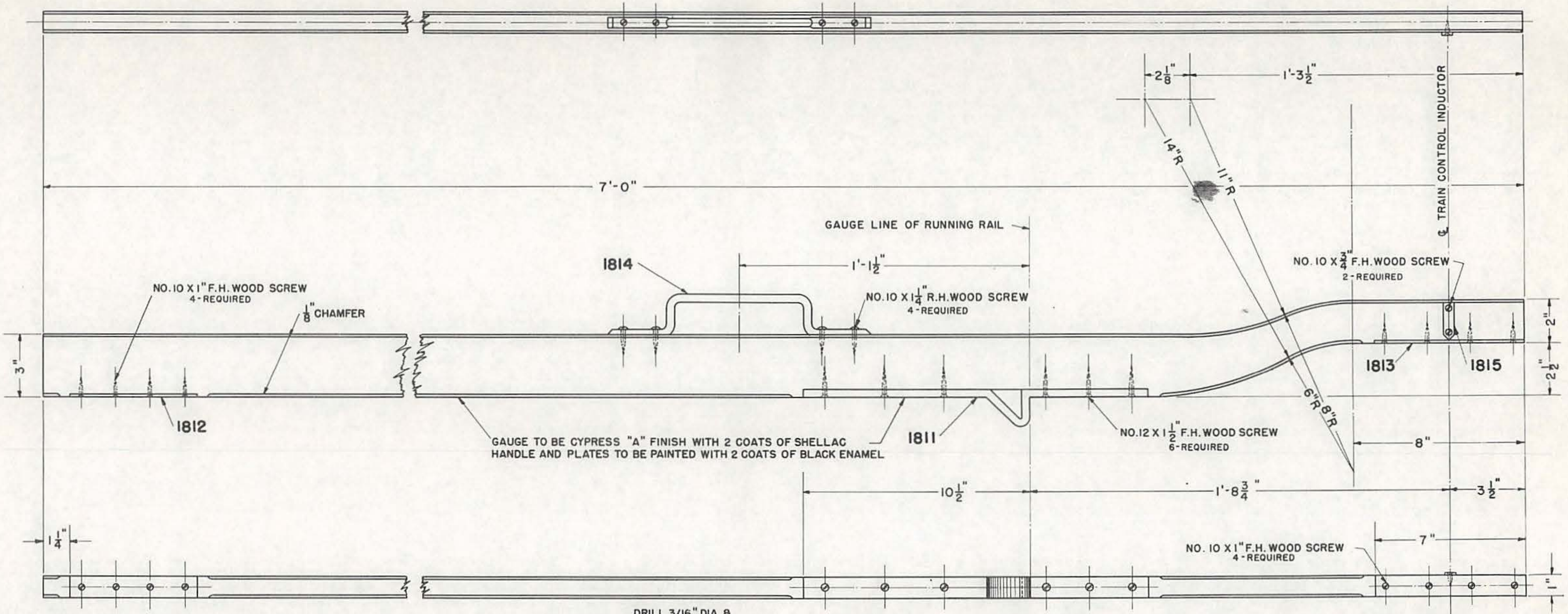
APPROVED: ______
CHIEF ENG'R. MAINTENANCE

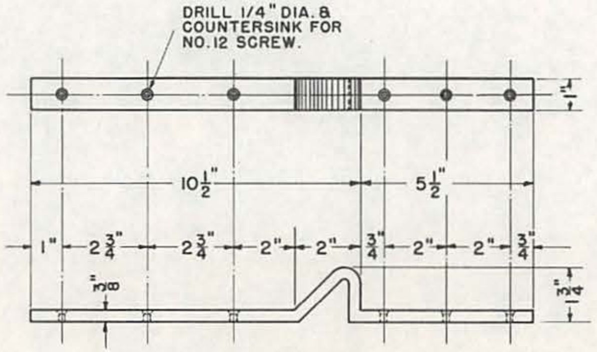
APPROVED: ______
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
END OF TRACK CIRCUIT AND CUT SECTION SIGNS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 2, 1949

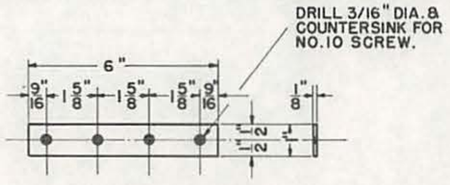
3-30-49 REDRAWN & REFLECTO ED.
SUPERCEDES PLAN A25-1D.
3-30-50 Revised account assembly numbers.

S-180-A

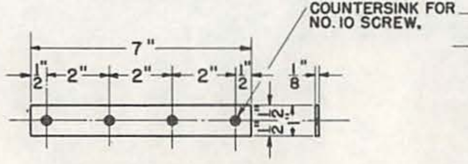

7'-0"
2 1/8"
1'-3 1/2"
℄ TRAIN CONTROL INDUCTOR
14"R
11"R
6"R
8"R
GAUGE LINE OF RUNNING RAIL
1814
1'-1 1/2"
NO. 10 X 1" F.H. WOOD SCREW 4-REQUIRED
1/8" CHAMFER
NO. 10 X 1 1/4" R.H. WOOD SCREW 4-REQUIRED
NO. 10 X 3/4" F.H. WOOD SCREW 2-REQUIRED
2"
2 1/2"
3"
1812
1813
1815
GAUGE TO BE CYPRESS "A" FINISH WITH 2 COATS OF SHELLAC
HANDLE AND PLATES TO BE PAINTED WITH 2 COATS OF BLACK ENAMEL
1811
NO. 12 X 1 1/2" F.H. WOOD SCREW 6-REQUIRED
8"
10 1/2"
1'-8 3/4"
3 1/2"
1 1/4"
7"
NO. 10 X 1" F.H. WOOD SCREW 4-REQUIRED
1"


DRILL 1/4" DIA. & COUNTERSINK FOR NO. 12 SCREW.
1"
10 1/2"
5 1/2"
1"
2 3/4"
2 3/4"
2"
2"
3/4"
2"
2"
3/4"
3/8"
1 3/4"

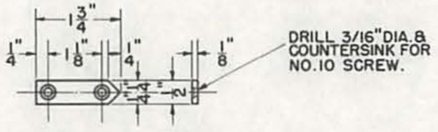
GAUGE PLATE - 1811


DRILL 3/16" DIA. & COUNTERSINK FOR NO. 10 SCREW.
6"
9/16"
1 5/8"
1 5/8"
1 5/8"
9/16"
1/8"
1/2"
1/2"
1"

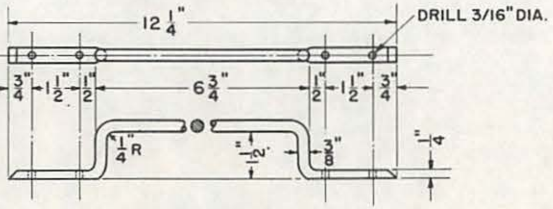
RAIL PLATE - 1812


DRILL 3/16" DIA. & COUNTERSINK FOR NO. 10 SCREW.
7"
1/2"
2"
2"
2"
1/2"
1/8"
1/2"
1/2"

INDUCTOR PLATE - 1813


1 3/4"
1/4"
1 1/8"
1/4"
1/8"
DRILL 3/16" DIA. & COUNTERSINK FOR NO. 10 SCREW.
1/4"
2"

CENTER PLATE - 1815


12 1/4"
DRILL 3/16" DIA.
3/4"
1 1/2"
1/2"
6 3/4"
1/2"
1 1/2"
3/4"
1/4"R
1/2"
3/8"
1/4"

HANDLE - 1814

Approved: C. Riley
Chief Engineer
Construction & Maintenance

Approved: A. L. Jordan
Signal Engineer

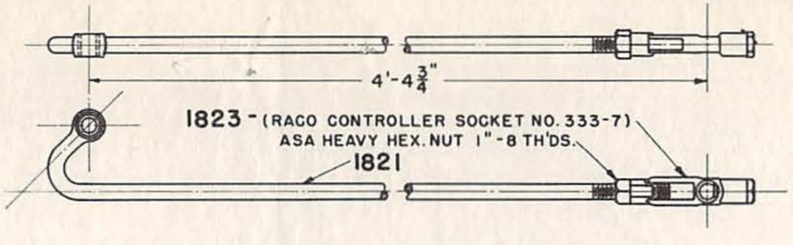
BALTIMORE & OHIO RAILROAD

TRACK INDUCTOR GAUGE

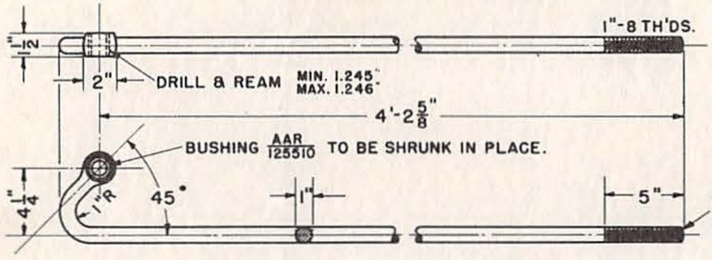
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

3-30-49 Redrawn & corrected, supersedes plan A25-2A.
6-13-57 Revised account inductor relocated.

S-181-A

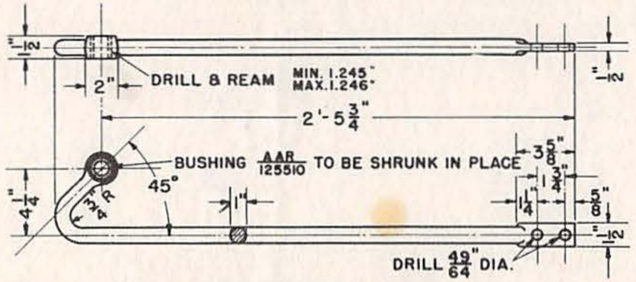

4'-4 3/4"
1823 - (RACO CONTROLLER SOCKET NO. 333-7)
ASA HEAVY HEX. NUT 1"-8 TH'DS.
1821

SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - 1820
(for Mechanical Switch Dwg. S-136)

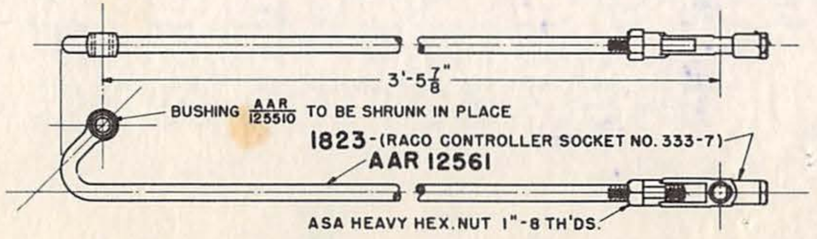

1 1/2"
2"
DRILL & REAM MIN. 1.245" MAX. 1.246"
1"-8 TH'DS.
4'-2 5/8"
BUSHING AAR/125510 TO BE SHRUNK IN PLACE.
4 1/4"
1"R
45°
1"
5"

THREADED ENDS AND PORTIONS WHICH HAVE BEEN SUBJECTED TO FORGING OPERATIONS TO BE NORMALIZED.

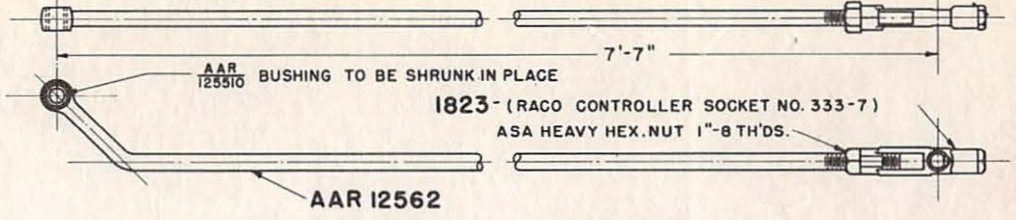
SWITCH CIRCUIT CONTROLLER ROD - 1821
SAE 1335 STEEL FORGED WITHOUT WELDS


1 1/2"
2"
DRILL & REAM MIN. 1.245" MAX. 1.246"
1/2"
2'-5 3/4"
BUSHING AAR/125510 TO BE SHRUNK IN PLACE
3 5/8"
1 3/4"
4 1/4"
45°
3/4"R
1"
1 1/4"
5/8"
1/2"
DRILL 49/64" DIA.

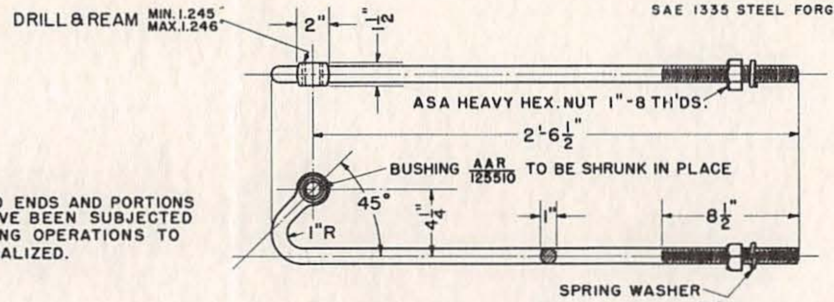
POINT DETECTOR ROD - 1822
(for 5A-B-C-D Switch Machines Dwg. S-147)
SAE 1335 STEEL FORGED WITHOUT WELDS


3'-5 7/8"
BUSHING AAR/125510 TO BE SHRUNK IN PLACE
1823 - (RACO CONTROLLER SOCKET NO. 333-7)
AAR 12561
ASA HEAVY HEX. NUT 1"-8 TH'DS.

SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - 1824
(for Hand Throw Switch)

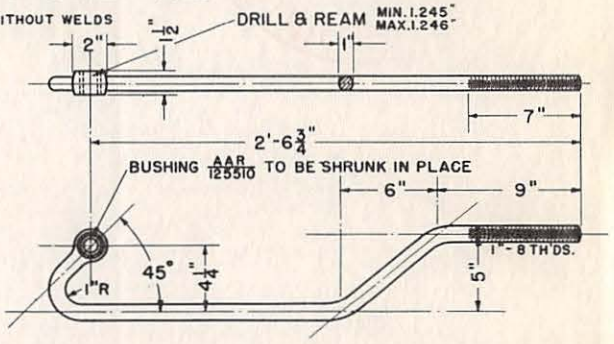

7'-7"
AAR/125510 BUSHING TO BE SHRUNK IN PLACE
1823 - (RACO CONTROLLER SOCKET NO. 333-7)
ASA HEAVY HEX. NUT 1"-8 TH'DS.
AAR 12562

SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - 1825
SAE 1335 STEEL FORGED WITHOUT WELDS

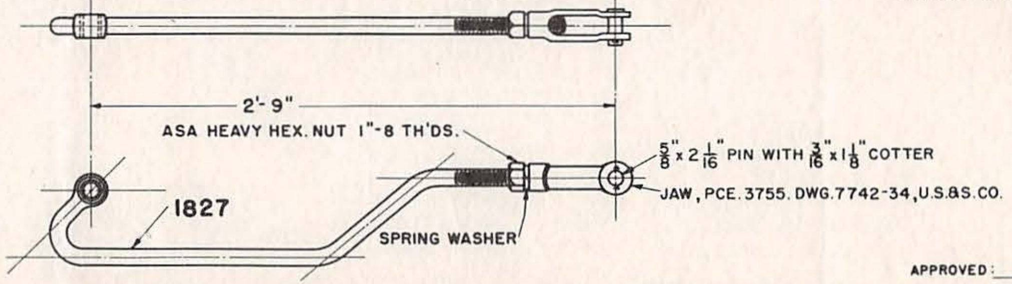

DRILL & REAM MIN. 1.245" MAX. 1.246"
2"
1/2"
ASA HEAVY HEX. NUT 1"-8 TH'DS.
2'-6 1/2"
BUSHING AAR/125510 TO BE SHRUNK IN PLACE
45°
4 1/4"
1"R
1"
8 1/2"
SPRING WASHER

POINT DETECTOR ROD ASSEMBLY - 1826
(for Style "A5" E.P.S. & L. Movement Dwg. S-160)
SAE 1035 STEEL HEAT TREATED

6.0.105342


2"
1/2"
DRILL & REAM MIN. 1.245" MAX. 1.246"
1"
7"
2'-6 3/4"
BUSHING AAR/125510 TO BE SHRUNK IN PLACE
6"
9"
1"-8 TH'DS.
45°
4 1/4"
5"
1"R

POINT DETECTOR ROD - 1827
SAE 1035 STEEL HEAT TREATED


2'-9"
ASA HEAVY HEX. NUT 1"-8 TH'DS.
5/8" x 2 1/16" PIN WITH 3/16" x 1 1/8" COTTER
JAW, PCE. 3755. DWG. 7742-34, U.S.&S.CO.
1827
SPRING WASHER

POINT DETECTOR ROD ASSEMBLY - 1828
(for Style "M2" or "M22" A&B S&L Movement Dwg. S-161)

APPROVED: C.B. Harons
CHIEF ENG'R. MAINTENANCE

APPROVED: A.L. Haus
CHIEF ENG'R. COMM. & SIGS.

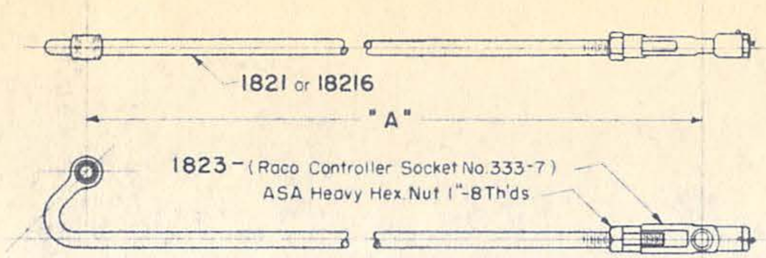
NOTES:
All threads shall be NC-2

BALTIMORE & OHIO RAILROAD
POINT DETECTOR RODS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 10, 1949

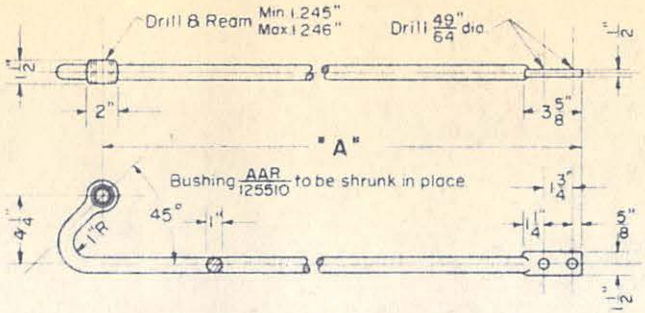
SHEET NO. 1
S-182

Adopted: 4-26-50.

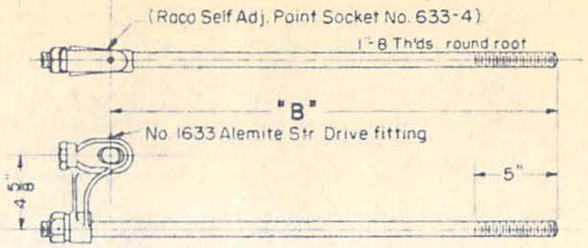
RECEIVED
NOV [illegible] 1950
SPECIFICATION DEPT.


1821 or 18216
"A"
1823 - (Raco Controller Socket No. 333-7)
ASA Heavy Hex Nut 1"-8 Th'ds

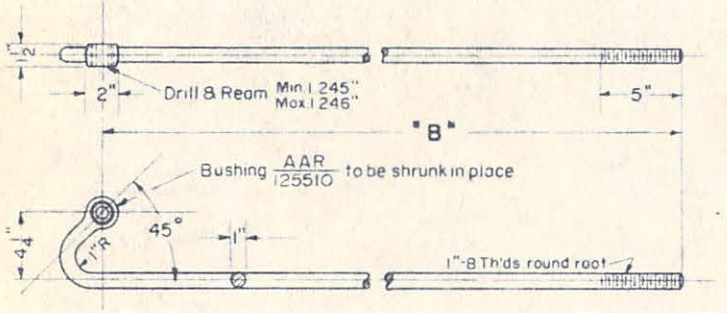
SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - **1820**
SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - **1824**


Drill & Ream Min. 1.245" Max. 1.246"
Drill 49/64" dia.
1 1/2"
2"
3 5/8"
"A"
Bushing AAR/125510 to be shrunk in place
1 3/4"
45°
1"
1"R
4 1/4"
1 1/4"
5/8"
1/2"

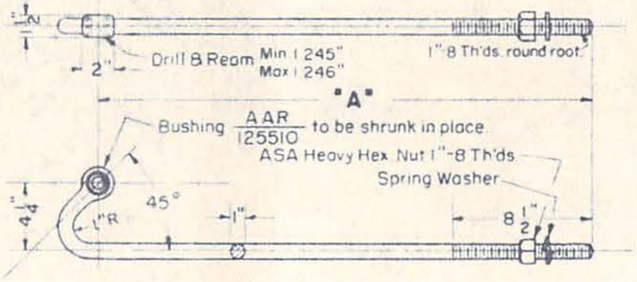
POINT DETECTOR CONNECTING ROD ASSEMBLY - **18214**
POINT DETECTOR CONNECTING ROD ASSEMBLY - **18215**
AISI-1335 Steel Forged without welds.


(Raco Self Adj. Point Socket No. 633-4)
1"-8 Th'ds round root
"B"
No. 1633 Alemite Str. Drive fitting
4 5/8"
5"

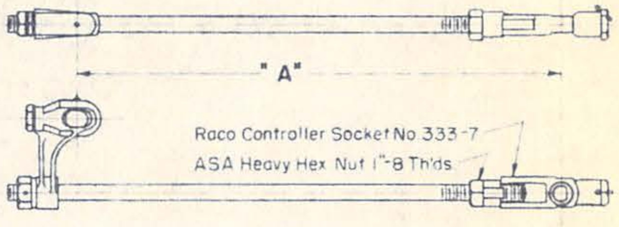
POINT DETECTOR CONNECTING ROD - **18235**
POINT DETECTOR CONNECTING ROD - **18236**
POINT DETECTOR CONNECTING ROD - **18237**
POINT DETECTOR CONNECTING ROD - **18238**


1 1/2"
2"
Drill & Ream Min. 1.245" Max. 1.246"
5"
"B"
Bushing AAR/125510 to be shrunk in place
45°
1"
1"R
4 1/4"
1"-8 Th'ds round root

SWITCH CIRCUIT CONTROLLER ROD - **1821**
SWITCH CIRCUIT CONTROLLER ROD - **18216**
AISI-1335 Steel Forged without welds


1 1/2"
2"
Drill & Ream Min. 1.245" Max. 1.246"
1"-8 Th'ds. round root
"A"
Bushing AAR/125510 to be shrunk in place
ASA Heavy Hex. Nut 1"-8 Th'ds
Spring Washer
45°
1"
1"R
4 1/4"
8 1/2"

POINT DETECTOR CONNECTING ROD ASSEMBLY - **1826**
C-1035 Steel Heat Treated


"A"
Raco Controller Socket No. 333-7
ASA Heavy Hex Nut 1"-8 Th'ds

POINT DETECTOR CONNECTING ROD ASSEMBLY - **1822**
POINT DETECTOR CONNECTING ROD ASSEMBLY - **18211**
POINT DETECTOR CONNECTING ROD ASSEMBLY - **18212**
POINT DETECTOR CONNECTING ROD ASSEMBLY - **18213**

USAGE TABLE

ASSEMBLY NO.	ROD NO.	DRAWING NO.	MFG. DRAWING NO.	DIMENSION		DIMENSION "X" ON LAYOUT (Gage to ℄ of Machine)	USE
				"A"	"B"		
1820	1821	S-182-B, sh. 1	GRS 43050-156, Gr 20	4'-4-3/4"	4'-2-1/8"	———	S-135-B, S-136-C.
1824	18216	S-182-B, sh. 1	" " Gr. 15.	3'-5-7/8"	3'-3-1/4"	———	Hand Throw Sws. & Dwg S-202-B
1822	18235	S-182-B, sh. 1	Raco 633-54	2'-5" ± 1/4"	2'-2-3/8" ± 1/4	3'-6"	Dwgs. S-147-F, S-216-B, S-218-A, S-240-A
1826		S-182-B, sh. 1		2'-6-1/2"	———	3'-6"	Dwg. S-160-C
18211	18236	S-182-B, sh. 1	Raco 633-55	2'-11" ± 1/4"	2'-8-3/8" ± 1/4"	4'-0"	Dwgs. S-165, S-166-B, S-167-B.
18212	18237	S-182-B, sh 1	Raco 633-56	5'-11" ± 1/4"	5'-8-3/8" ± 1/4"	7'-0"	Dwgs. S-165, S-166-A, S-167-A.
18213	18238	S-182-B, sh. 1	Raco 633-57	1'-6-3/4" ± 1/4"	1"-4-1/8" ± 1/4"	2'-8"	S-216-B
18214		S-182-B, sh. 1		3'-4-1/4 ± 1/4"	———	3'-6"	S-217-A
18215		S-182-B, sh. 1	GRS 43050-116, Gr. 3.	2'-6" ± 1/4"	———	2'-8"	S-217-A

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

Approved
Chief Eng'r Maintenance

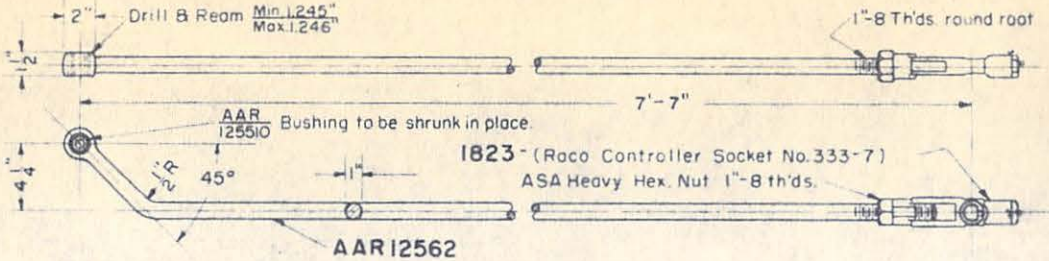
Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
POINT DETECTOR RODS
Office of Signal Engineer
Baltimore, Md
Aug. 26, 1954

Sheet No. 1

S-182-B

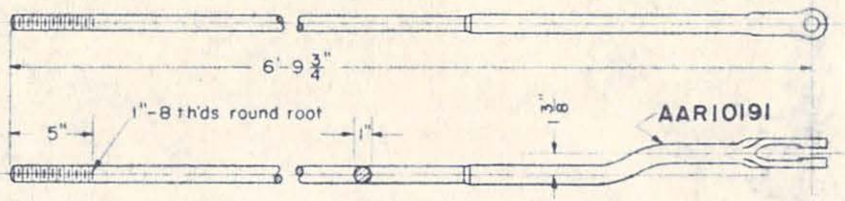
Revised 8-29-54
Revised 5-17-55


2"
Drill & Ream $\frac{\text{Min } 1.245"}{\text{Max } 1.246"}$
1"-8 Th'ds round root
$1\frac{1}{2}"$
7'-7"
$\frac{\text{AAR}}{125510}$ Bushing to be shrunk in place
1823-(Raco Controller Socket No. 333-7)
ASA Heavy Hex. Nut 1"-8 th'ds.
$4\frac{1}{4}"$
$\frac{1}{2}"$R
45°
1"
AAR 12562

SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY - **1825**

G.R.S. No. 43200-118 Gr. 31

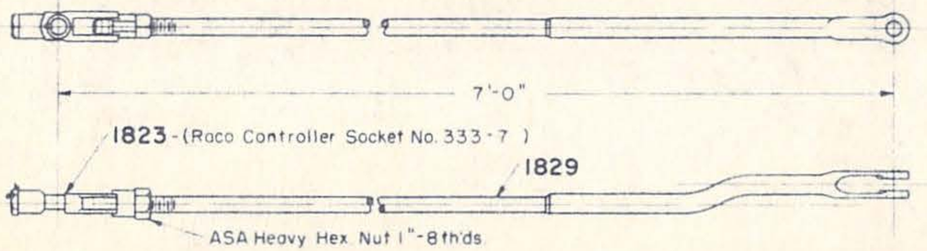
AISI-1335 Steel forged without welds


6'-9 $\frac{3}{4}"$
1"-8 th'ds round root
5"
1"
$1\frac{3}{8}"$
AAR 10191

SWITCH CIRCUIT CONTROLLER ROD - **1829**

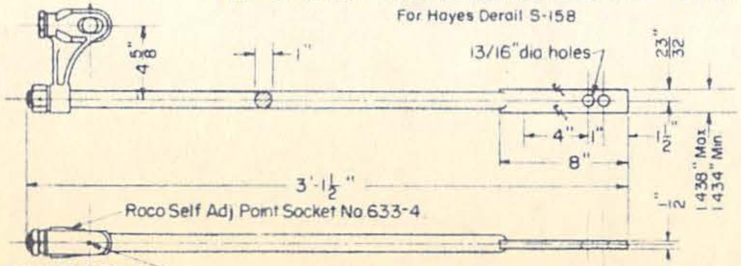
G.R.S. No. 137-11

AISI-1335 Steel


7'-0"
1823-(Raco Controller Socket No. 333-7)
1829
ASA Heavy Hex Nut 1"-8 th'ds

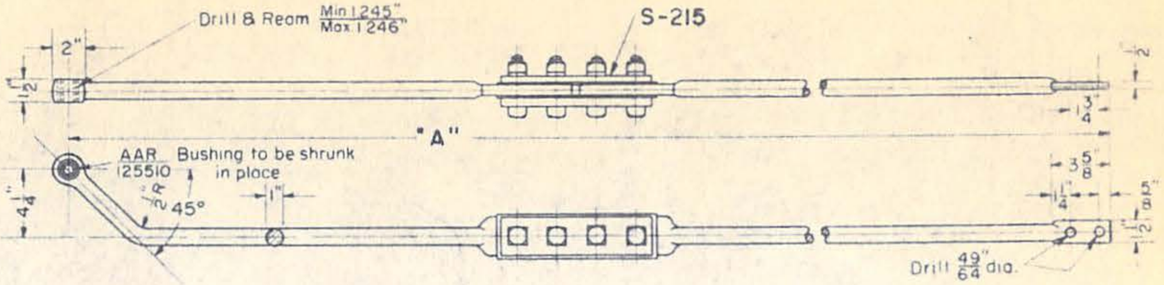
SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY-**18210**

For Hayes Derail S-158


$4\frac{5}{8}"$
1"
13/16" dia holes
$\frac{23}{32}"$
4"
1"
8"
$\frac{1}{2}"$
$3'-1\frac{1}{2}"$
$\frac{1}{2}"$
1.438" Max
1.434" Min
Raco Self Adj Point Socket No. 633-4
No. 1633 Alemite Str Drive Fitting

POINT DETECTOR CONNECTING ROD - **1827**

Raco No. 633-38

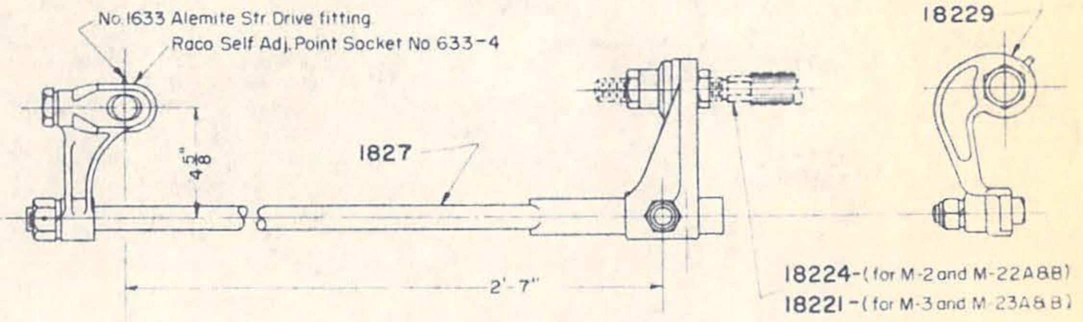

Drill & Ream $\frac{\text{Min } 1.245"}{\text{Max } 1.246"}$
S-215
2"
$1\frac{1}{2}"$
$\frac{1}{2}"$
$1\frac{3}{4}"$
"A"
$\frac{\text{AAR}}{125510}$ Bushing to be shrunk in place
$\frac{1}{2}"$R
45°
1"
$4\frac{1}{4}"$
$3\frac{5}{8}"$
$1\frac{1}{4}"$
$\frac{5}{8}"$
$1\frac{1}{2}"$
Drill $\frac{49}{64}"$ dia.

SWITCH CIRCUIT CONTROLLER ROD ASSEMBLY

"A" = 7'-9-1/2" when "X" = 3'-6" Dwg. S-217 - **18217**

"A" = 6'-11-1/2" when "X" 2'-8" Dwg. S-217 - **18218**

(used on Movable Point Frog of Double Slip Switch)


No. 1633 Alemite Str Drive fitting
Raco Self Adj. Point Socket No. 633-4
18229
$4\frac{5}{8}"$
1827
2'-7"
18224-(for M-2 and M-22A&B)
18221-(for M-3 and M-23A&B)

POINT DETECTOR CONNECTING ROD ASSEMBLY -**1828**

(for Style "M2", "M3", "M22" A&B, and "M23" A&B)

Raco No. 633-40

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

Approved. ALRiley
Chief Eng'r Maintenance

Approved A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

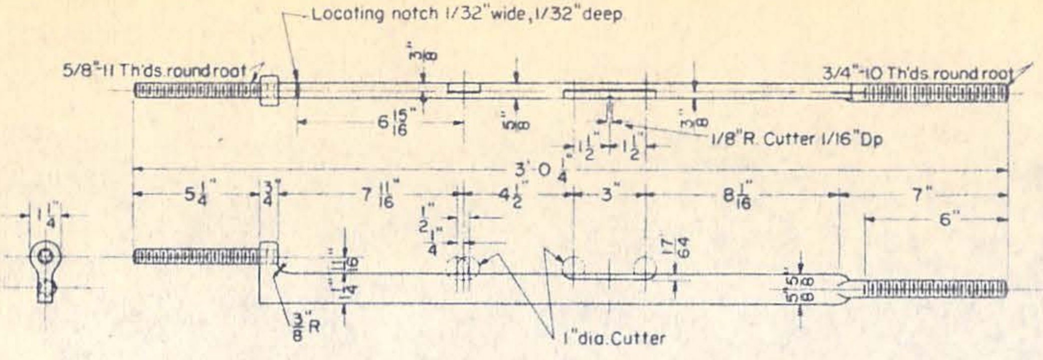
POINT DETECTOR RODS

Office of Signal Engineer
Baltimore, Md
Sept. 15, 1952

Sheet No. 2

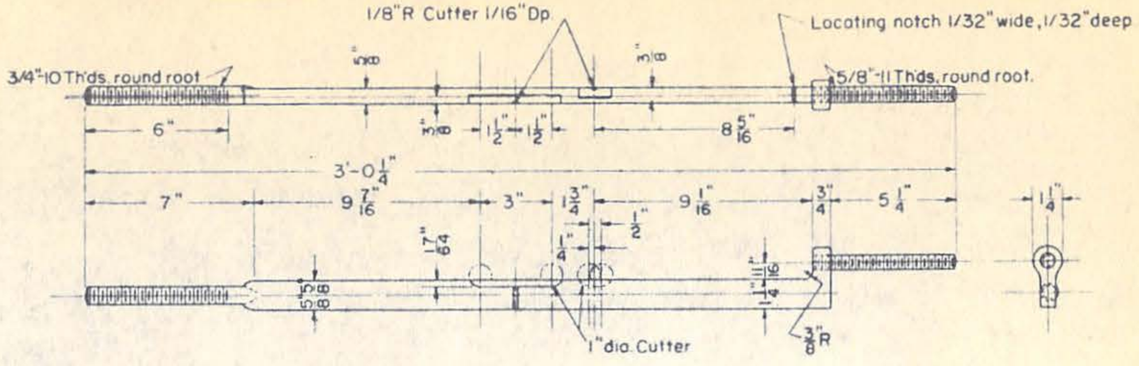
S-182-B

Adopted 1-12-54
Revised 5-17-55



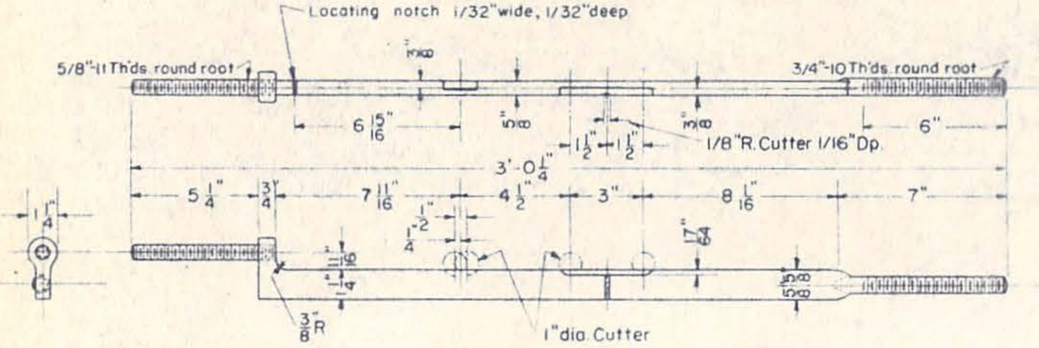
Locating notch 1/32" wide, 1/32" deep
5/8"-11 Th'ds round root
3/4"-10 Th'ds round root
6 15/16"
1/8"R. Cutter 1/16" Dp
1 1/2"
3'-0 1/4"
5 1/4"
3/4"
7 11/16"
4 1/2"
3"
8 1/16"
7"
6"
17/64"
5/8"
3/8"R
1" dia. Cutter
1 1/4"

POINT DETECTOR ROD WITH STUD - **18225**
G.R.S. No. 56931-Gr. 1



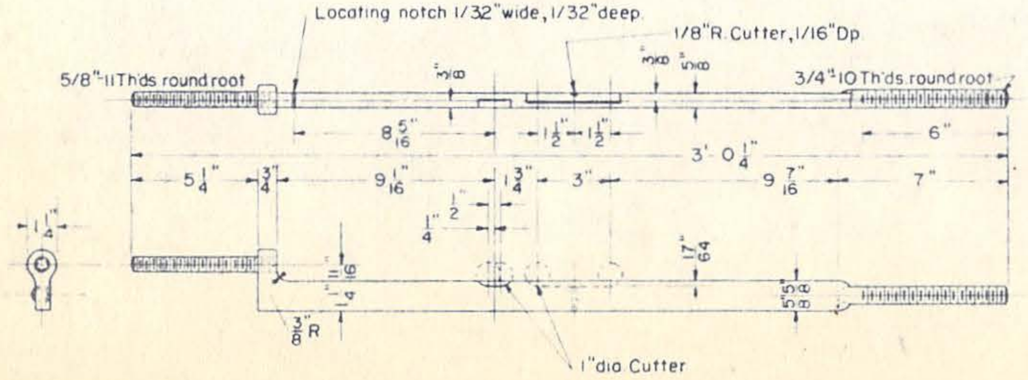
1/8"R Cutter 1/16" Dp
Locating notch 1/32" wide, 1/32" deep
3/4"-10 Th'ds. round root
5/8"-11 Th'ds. round root
6"
1 1/2"
8 5/16"
3'-0 1/4"
7"
9 7/16"
3"
1 3/4"
9 1/16"
3/4"
5 1/4"
17/64"
5/8"
1" dia. Cutter
3/8"R
1 1/4"

POINT DETECTOR ROD WITH STUD - **18228**
G.R.S. No. 56931-Gr. 9



Locating notch 1/32" wide, 1/32" deep
5/8"-11 Th'ds. round root
3/4"-10 Th'ds. round root
6 15/16"
1 1/2"
1/8"R. Cutter 1/16" Dp.
6"
3'-0 1/4"
5 1/4"
3/4"
7 11/16"
4 1/2"
3"
8 1/16"
7"
17/64"
5/8"
3/8"R
1" dia. Cutter
1 1/4"

POINT DETECTOR ROD WITH STUD - **18226**
G.R.S. No. 56931-Gr. 3



Locating notch 1/32" wide, 1/32" deep
1/8"R. Cutter, 1/16" Dp.
5/8"-11 Th'ds round root
3/4"-10 Th'ds round root
8 5/16"
1 1/2"
6"
3'-0 1/4"
5 1/4"
3/4"
9 1/16"
1 3/4"
3"
9 7/16"
7"
17/64"
5/8"
3/8"R
1" dia. Cutter
1 1/4"

POINT DETECTOR ROD WITH STUD - **18227**
G.R.S. No. 56931-Gr. 2

Notes:

All threads shall be NC-2

Approved Chief Eng'r. Maintenance

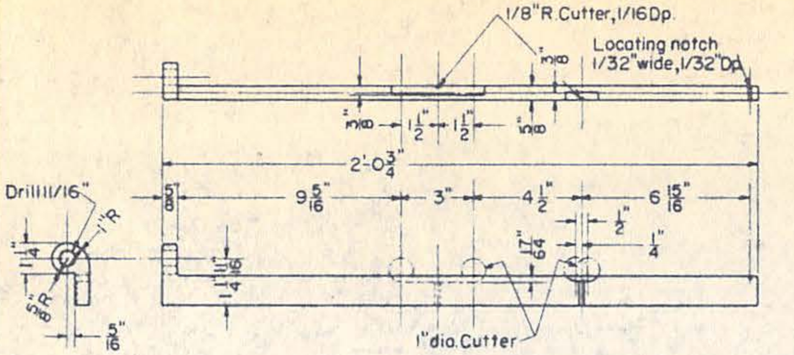
Approved A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
POINT DETECTOR RODS
Office of Signal Engineer
Baltimore, Md.
Oct. 31, 1952

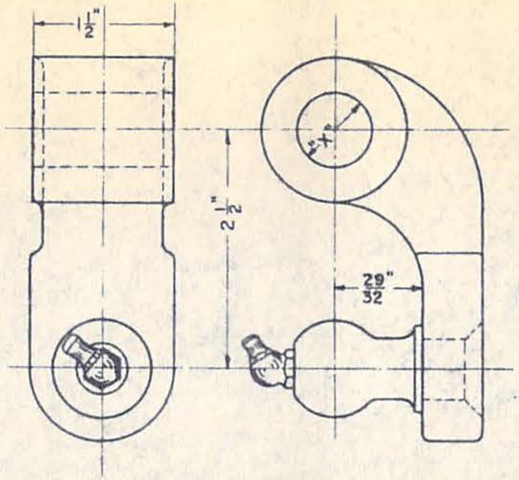
Sheet No. 3

S-182-B

Adopted 1-12-54
1-18-55 Sheet No. changed
Revised 5-7-55

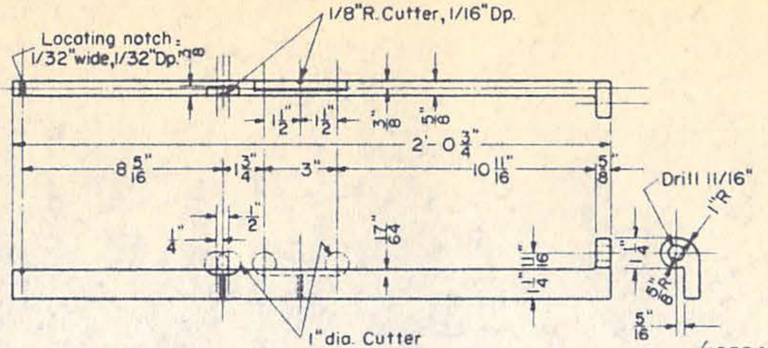

1/8"R. Cutter, 1/16 Dp.
Locating notch 1/32"wide, 1/32"Dp.
2'-0 3/4"
Drill 11/16"
1"R
9 5/16"
3"
4 1/2"
6 15/16"
17/64"
1 1/4"
1 11/16"
5/8"R
5/16"
1"dia. Cutter

ADJUSTING PLATE – **18230**
G.R.S. No. 51176-1

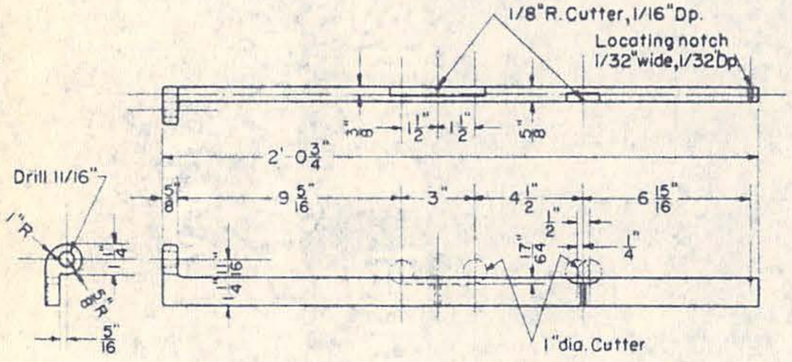

1 1/2"
2 1/2"
X
29/32"

DETECTOR ROD LUG "X"=49/64" – **18239**
G.R.S. No. 59534-1-Gr.1 with No. 1646 Alemite fitting.

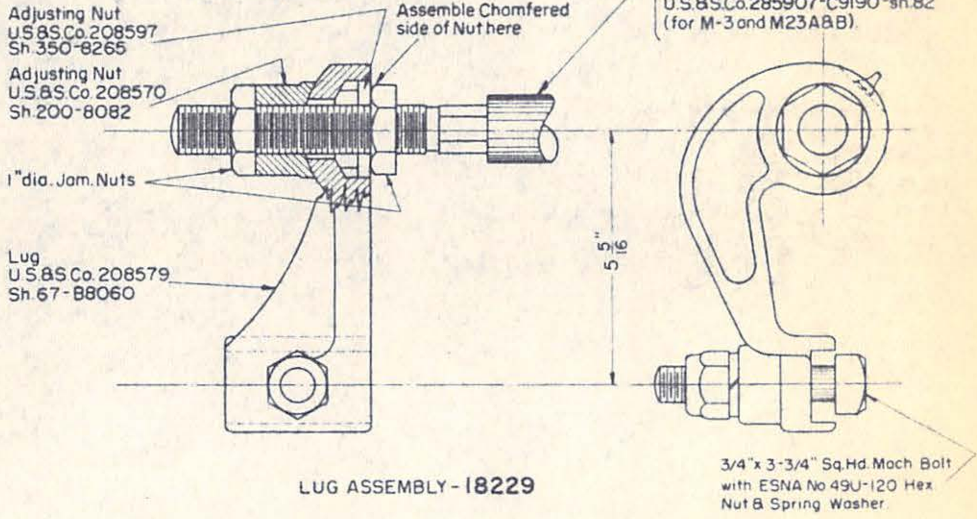
DETECTOR ROD LUG "X"=1-1/64" – **18240**
G.R.S. No. 59534-1-Gr.2 with No. 1646 Alemite fitting.


1/8"R. Cutter, 1/16"Dp.
Locating notch: 1/32"wide, 1/32"Dp.
2'-0 3/4"
8 5/16"
1 3/4"
3"
10 11/16"
Drill 11/16"
1"R
17/64"
1 11/16"
5/8"R
5/16"
1"dia. Cutter

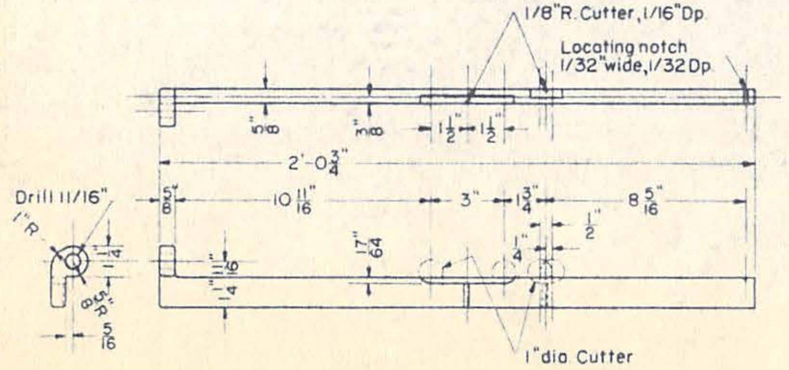
ADJUSTING PLATE – **18233**
G.R.S. No. 51176-24


1/8"R. Cutter, 1/16"Dp.
Locating notch 1/32"wide, 1/32"Dp.
2'-0 3/4"
Drill 11/16"
9 5/16"
3"
4 1/2"
6 15/16"
1"R
17/64"
1 11/16"
5/8"R
5/16"
1"dia. Cutter

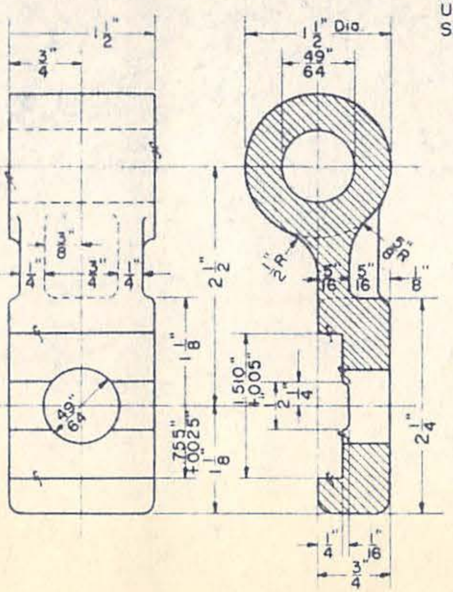
ADJUSTING PLATE – **18231**
G.R.S. No. 51176-5


18224-(order separate)
U.S.&S.Co. 208591-C9190-sh.52
(for M-2 and M-22A&B).
18221-(order separate)
U.S.&S.Co. 285907-C9190-sh.82
(for M-3 and M23A&B).
Adjusting Nut
U.S.&S.Co. 208597
Sh. 350-8265
Adjusting Nut
U.S.&S.Co. 208570
Sh. 200-8082
Assemble Chamfered side of Nut here
1"dia. Jam Nuts
Lug
U.S.&S.Co. 208579
Sh. 67-B8060
5 5/16"
3/4"x 3-3/4" Sq.Hd. Mach. Bolt with ESNA No. 49U-120 Hex Nut & Spring Washer.

LUG ASSEMBLY – **18229**


1/8"R. Cutter, 1/16"Dp.
Locating notch 1/32"wide, 1/32 Dp.
2'-0 3/4"
Drill 11/16"
10 11/16"
3"
1 3/4"
8 5/16"
1"R
17/64"
1 11/16"
5/8"R
5/16"
1"dia. Cutter

ADJUSTING PLATE – **18232**
G.R.S. No. 51176


1 1/2"
1 1/2" Dia.
49/64"
3/4"
2 1/2"
1 1/8"
49/64"
1.510"
±.005"
.755"
±.0025"
2 1/4"
5/16"
1/8"
1/4"
1/16"
3/4"

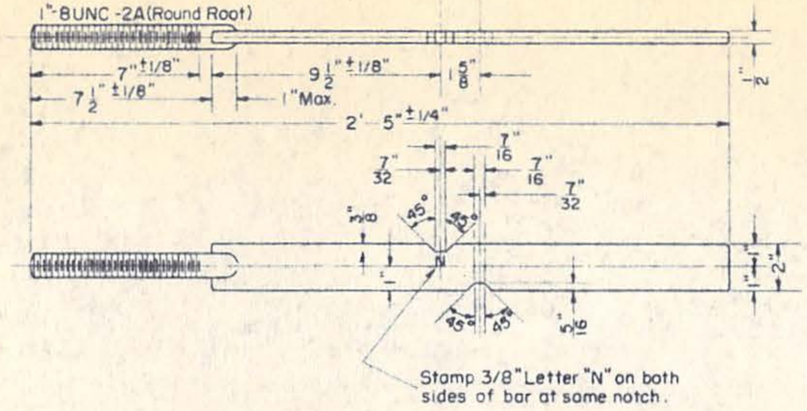
DETECTOR ROD LUG – **18234**
Material: Malleable Iron Casting
G.R.S. No. 30908-4

Approved: ____ Chief Eng'r. Maintenance

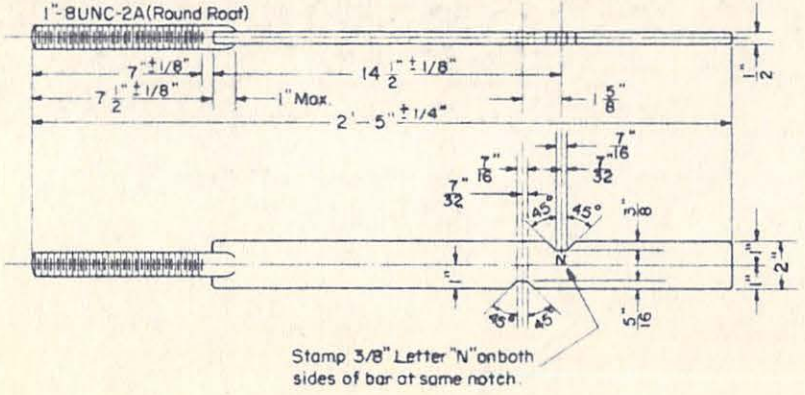
Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
POINT DETECTOR RODS
Office of Signal Engineer
Baltimore, Md.
Nov. 6, 1952

Adopted 1-12-54
8-31-54, 18239-18240 shown
1-18-55 Sheet No. changed
Revised 5-17-55


1"-8UNC-2A(Round Root)
7"±1/8"
9 1/2"±1/8"
1 5/8"
7 1/2"±1/8"
1"Max.
2'-5"±1/4"
1/2"
7/16"
7/32"
7/16"
7/32"
45°
45°
3/8"
1"
N
1"
1"
2"
45°
45°
5/16"
Stamp 3/8" Letter "N" on both sides of bar at same notch.

POINT DETECTOR ROD - **18241**
G.R.S. No 50465-3


1"-8UNC-2A(Round Root)
7"±1/8"
14 1/2"±1/8"
7 1/2"±1/8"
1"Max.
1 5/8"
2'-5"±1/4"
1/2"
7/16"
7/32"
7/16"
7/32"
45°
45°
3/8"
1"
N
1"
1"
2"
45°
45°
5/16"
Stamp 3/8" Letter "N" on both sides of bar at same notch.

POINT DETECTOR ROD - **18242**
G.R.S. No. 50465-4

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

Approved: Chief Eng'r. Maintenance

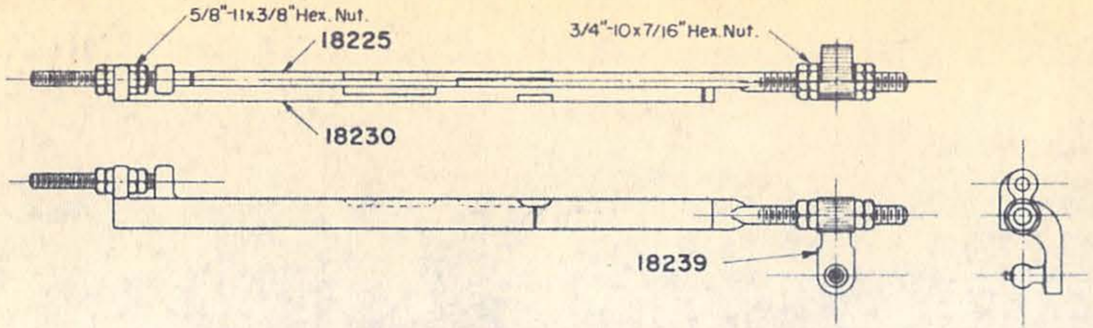
Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
POINT DETECTOR RODS
Office of Signal Engineer
Baltimore, Md.
Jan. 16, 1955

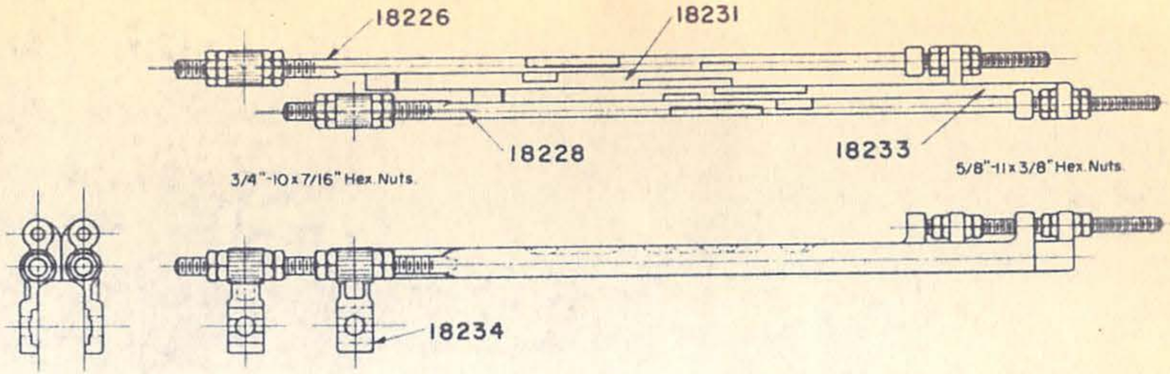
1-16-55 New plan added
Revised 5-17-55

Sheet No. 5

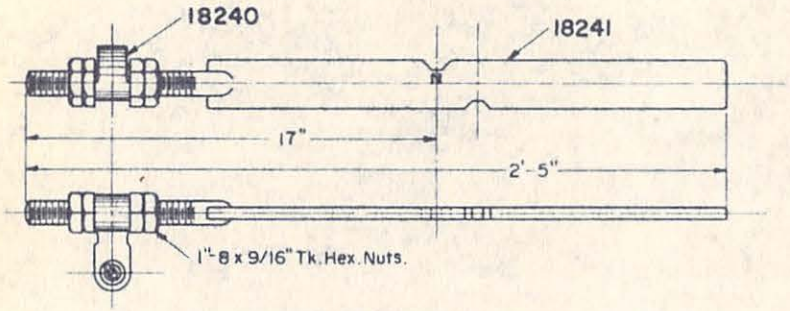
S-182-B


5/8"-11x3/8" Hex. Nut.
18225
3/4"-10x7/16" Hex. Nut.
18230
18239

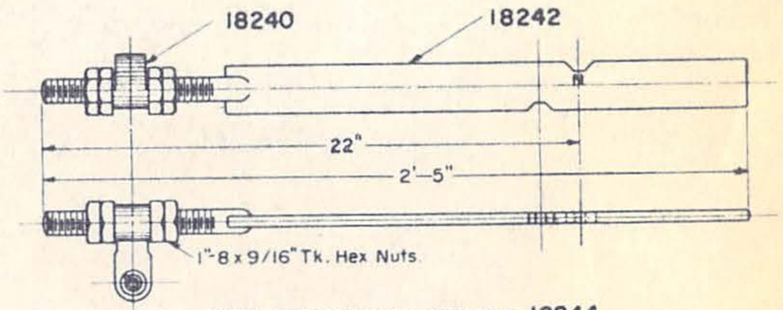
POINT DETECTOR ROD ASSEMBLY - 18220 (for 5A-B-C-D Switch Machines)
used on Derails-Single Switches-Single Slip Switches
G.R.S. No. 51327-1 Gr. I.


18226
18231
18228
18233
3/4"-10x7/16" Hex Nuts.
5/8"-11x3/8" Hex Nuts.
18234

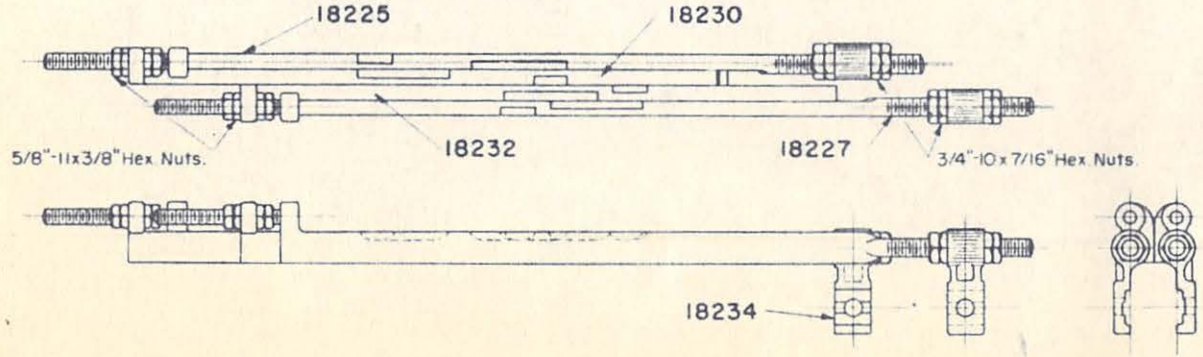
POINT DETECTOR ROD ASSEMBLY - 18223 (for 5A-B-C-D Switch Machines)
used on Movable Point Frog - Right Hand.
G.R.S. Nos. 51327-2 & 51327-11 Gr. I.


18240
18241
17"
2'-5"
1"-8 x 9/16" Tk. Hex. Nuts.

POINT DETECTOR ROD ASSEMBLY - 18243
used on Model 9 Hand Operated Switch Machine-Closed Point-S-165-S-166-S-167
G.R.S. No. 50461-1, Fig. 1.


18240
18242
22"
2'-5"
1"-8 x 9/16" Tk. Hex Nuts.

POINT DETECTOR ROD ASSEMBLY - 18244
used on Model 9 Hand Operated Switch Machine-Open Point- S-165-S-166-S-167
G.R.S. No. 50461-1, Fig. 2.


18225
18230
5/8"-11x3/8" Hex. Nuts.
18232
18227
3/4"-10x7/16" Hex. Nuts.
18234

POINT DETECTOR ROD ASSEMBLY - 18222 (for 5A-B-C-D Switch Machines) used on
Movable Point Frog - Left Hand
G.R.S. Nos. 51327-1 Gr. I & 51327 Gr. I

Approved: Chief Eng'r. Maintenance

Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD

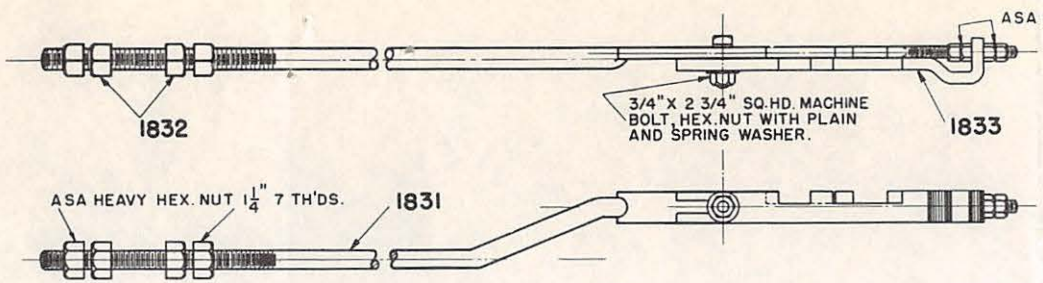
POINT DETECTOR RODS

Office of Signal Engineer
Baltimore, Md.
Nov. 26, 1954

Sheet No. 6

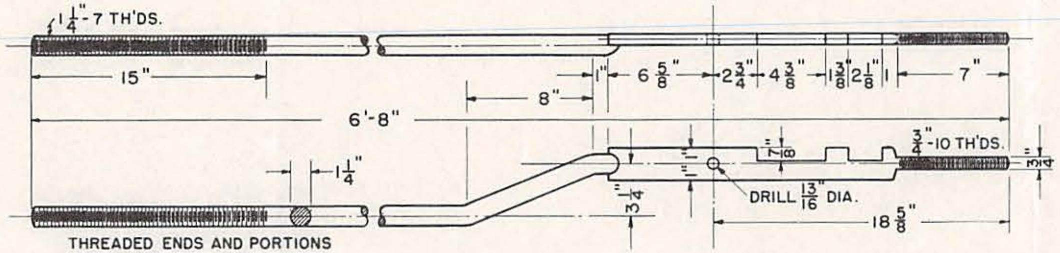
S-182-B

New Plan made.
Revised: 1-18-55- Assemblies 1824[illegible] 44 shown.
Revised: 5-17-55



ASA HEAVY HEX. NUT 3/4"-10 TH'DS.
1832
3/4" X 2 3/4" SQ. HD. MACHINE BOLT, HEX. NUT WITH PLAIN AND SPRING WASHER.
1833
ASA HEAVY HEX. NUT 1 1/4" 7 TH'DS.
1831

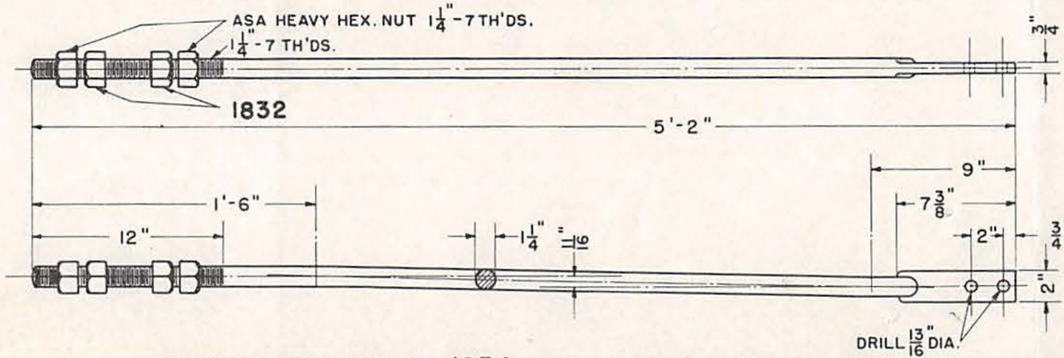
LOCK ROD ASSEMBLY - **1830** (for Mechanical Switch Dwg. S-136)



1 1/4"-7 TH'DS.
15"
1"
6 5/8"
2 3/4"
4 3/8"
1 3/8"
2 1/8"
1
7"
8"
6'-8"
3/4"-10 TH'DS.
7/8
3/4
1 1/4"
3 1/4
DRILL 13/16" DIA.
18 5/8"

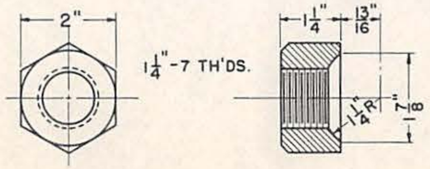
THREADED ENDS AND PORTIONS WHICH HAVE BEEN SUBJECTED TO FORGING OPERATIONS TO BE NORMALIZED.

LOCK ROD - **1831**
SAE 1335 STEEL FORGED WITHOUT WELDS



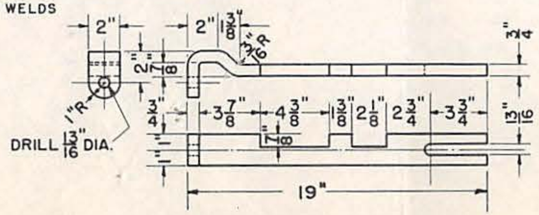
ASA HEAVY HEX. NUT 1 1/4"-7 TH'DS.
1 1/4"-7 TH'DS.
1832
3/4"
5'-2"
9"
7 3/8"
1'-6"
12"
1 1/4"
11/16
2"
3/4"
2"
DRILL 13/16 DIA.

LOCK ROD CONNECTING ROD - **1834** (for 5A-B-C-D Switch Machines Dwg. S-147)
SAE 1335 STEEL FORGED WITHOUT WELDS



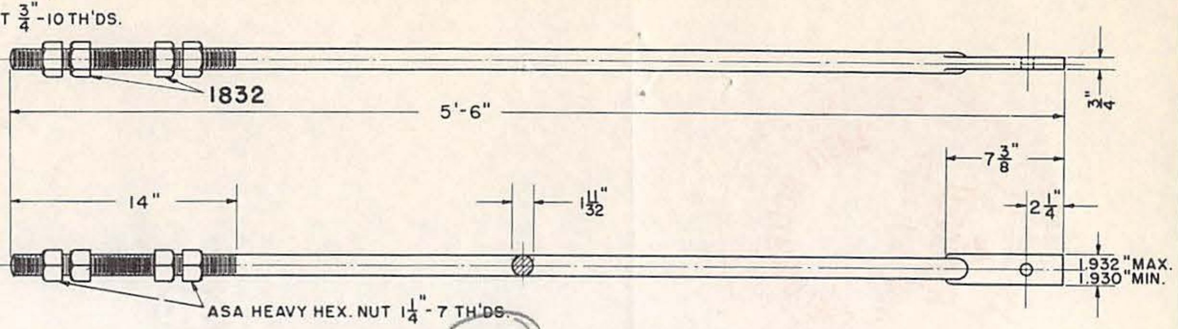
2"
1 1/4"-7 TH'DS.
1 1/4"
13/16"
1 1/4" R
7/8"

CUPPED NUT - **1832**



2"
2"
1 3/8"
3/16" R
3/4"
2"
7/8
1" R
DRILL 13/16" DIA.
3/4
3 7/8"
4 3/8"
1 3/8
2 1/8
2 3/4"
3 3/4"
13/16
7/8
1"
19"

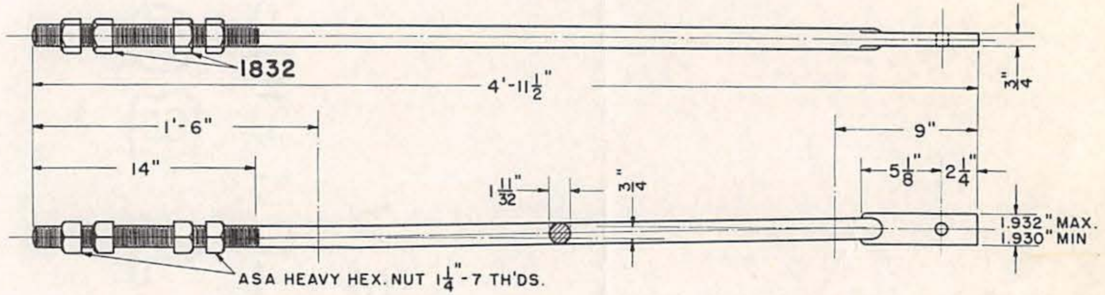
LOCK PLATE - **1833**
SAE 1335 STEEL FORGED WITHOUT WELDS



1832
5'-6"
3/4"
7 3/8"
14"
1 11/32
2 1/4
1.932" MAX.
1.930" MIN.
ASA HEAVY HEX. NUT 1 1/4"-7 TH'DS.

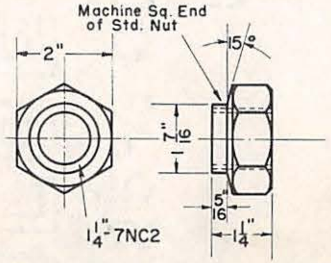
LOCK ROD CONNECTING ROD - **1835** (for Style "A5" E.P.S.& L. Movement Dwg. S-160)
SAE 1035 STEEL FORGED WITHOUT WELDS

60-105342



1832
4'-11 1/2"
3/4"
1'-6"
14"
9"
5 1/8"
2 1/4"
1 11/32
3/4
1.932" MAX.
1.930" MIN
ASA HEAVY HEX. NUT 1 1/4"-7 TH'DS.

LOCK ROD CONNECTING ROD - **1836** (for Style "M2" or "M22" A&B S&L. Movement Dwg. S-161)
SAE 1035 STEEL FORGED WITHOUT WELDS



Machine Sq. End of Std. Nut
2"
15°
7/16
5/16
1 1/4"-7NC2
1 1/4"

NO. 3811-H-2-A RAMAPO AJAX LOCK ROD NUT - **1837**
ORDER IN LIEU OF 1832 WHEN RAMAPO AJAX "MF" FRONT ROD IS USED.

NOTES:
All threads shall be NC-2

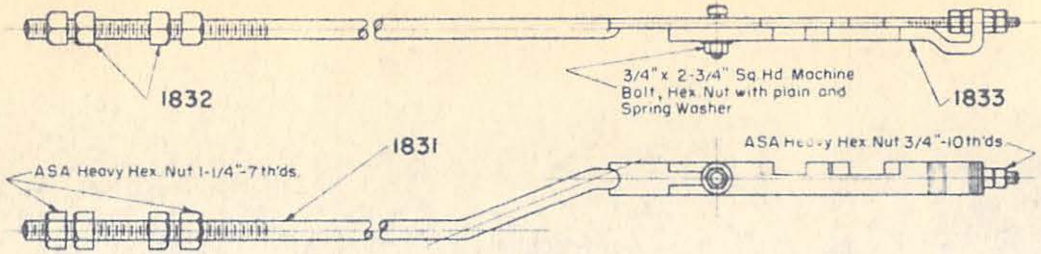
APPROVED: ____________ CHIEF ENG'R. MAINTENANCE

APPROVED: ____________ CHIEF ENG'R. COMM. & SIGS.

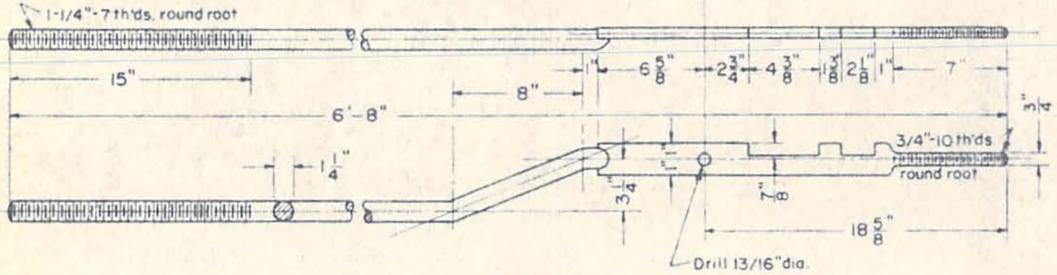
BALTIMORE & OHIO RAILROAD
LOCK RODS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 15, 1949

SHEET NO. 1
S-183

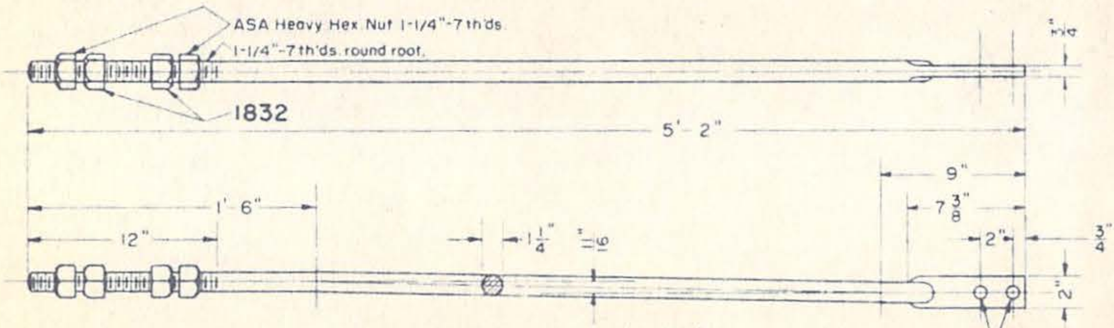
Adopted 4-26-50.


1832
3/4" x 2-3/4" Sq.Hd Machine Bolt, Hex Nut with plain and Spring Washer
1833
1831
ASA Heavy Hex Nut 3/4"-10 th'ds.
ASA Heavy Hex. Nut 1-1/4"-7 th'ds.

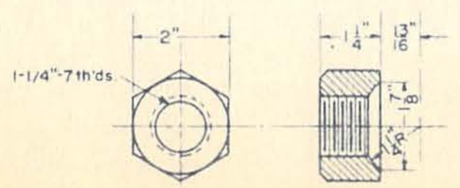
LOCK ROD ASSEMBLY - **1830**
for Mechanical Split Switch Derail, Dwg S-135
for Mechanical Switch, Dwg S-136
GRS No. 21900-79 Gr. 2


1-1/4"-7 th'ds. round root
15"
6'-8"
8"
1"
6 5/8"
2 3/4"
4 3/8"
1 3/8"
2 1/8"
1"
7"
3/4"
1 1/4"
3/4"-10 th'ds. round root
3 1/4"
7/8"
18 5/8"
Drill 13/16" dia.

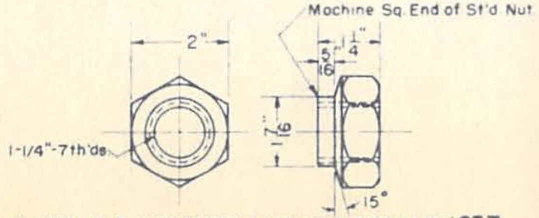
LOCK ROD - **1831**
GRS No. 21758-213


ASA Heavy Hex Nut 1-1/4"-7 th'ds.
1-1/4"-7 th'ds. round root.
1832
3/4"
5'-2"
9"
7 3/8"
1'-6"
12"
1 1/4"
11/16"
2"
3/4"
2"
Drill 13/16" dia.

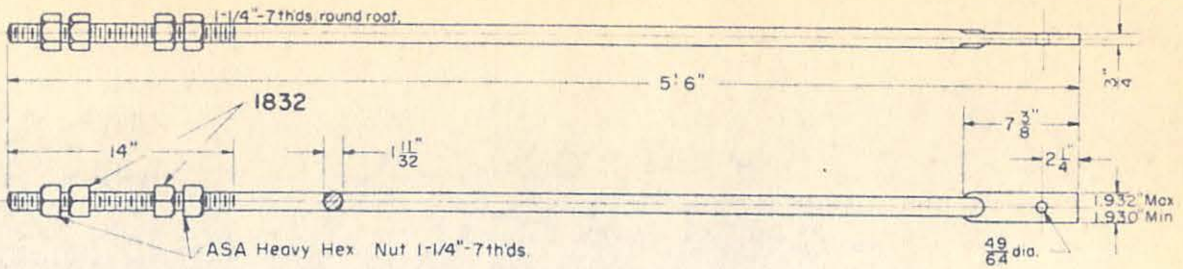
LOCK ROD CONNECTING ROD - **1834**
5A-B-C-D Switch Layout Dwg S-147, Split Switch Derail using 5A or 5C Switch Machine Dwg. S-218
GRS No. 23108-51 Gr. 1
AISI-1335 Steel forged without welds


2"
1-1/4"-7 th'ds.
1 1/4"
13/16"
7/8"
1 1/8"

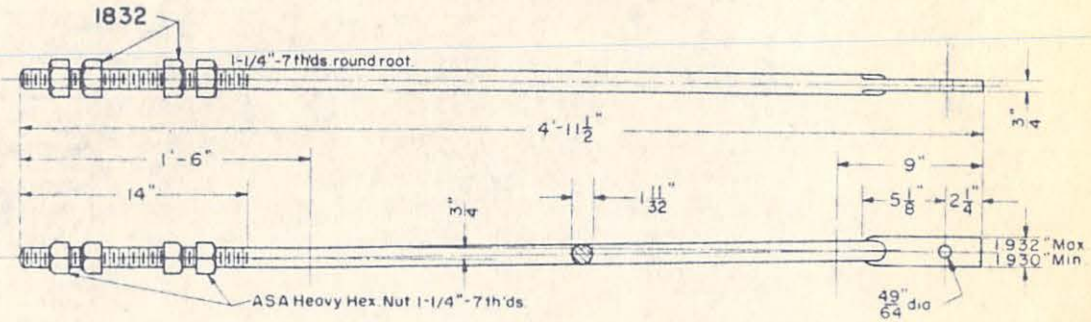
CUPPED NUT - **1832**
GRS No 545-16


Machine Sq. End of St'd Nut
2"
5/16"
1 1/4"
1-1/4"-7 th'ds.
7/16"
1 1/8"
15°

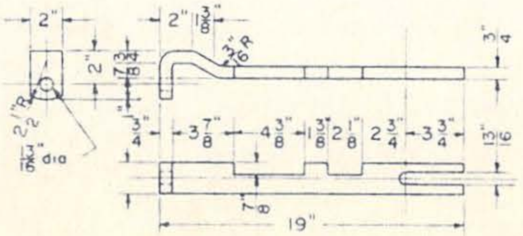
No. 3811-H-2-A RAMAPO AJAX LOCK ROD NUT - **1837**
Order in lieu of 1832 when Ramapo Ajax "MF" Front Rod is used.


1-1/4"-7 th'ds. round root.
5'6"
3/4"
1832
7 3/8"
14"
1 11/32"
2 1/4"
1.932" Max
1.930" Min
ASA Heavy Hex Nut 1-1/4"-7 th'ds.
49/64" dia.

LOCK ROD CONNECTING ROD - **1835**
for Style "A5" E.P.S.&L. Movement, Dwg. S-160.
C-1035 Steel forged without welds


1832
1-1/4"-7 th'ds. round root.
3/4"
4'-11 1/2"
1'-6"
14"
3/4"
1 11/32"
9"
5 1/8"
2 1/4"
1.932" Max
1.930" Min
ASA Heavy Hex Nut 1-1/4"-7 th'ds.
49/64" dia.

LOCK ROD CONNECTING ROD - **1836**
for Style "M2 or M22" AB&S&L Movement, Dwg. S-161
C-1035 Steel forged without welds


2"
2"
1 3/8"
3/4"
3/4" R
2"
7/8"
1 3/8"
2 1/2" R
3/4"
3 7/8"
4 3/8"
1 3/8"
2 1/8"
2 3/4"
3 3/4"
13/16"
13/16" dia.
7/8"
19"

LOCK PLATE - **1833**
GRS No. 3184-32
AISI-1335 Steel forged without welds

Notes:

Lock Rod Assemblies will be furnished with Nuts unless otherwise specified.

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2

Approved C. Oliver
Chief Eng'r. Maintenance

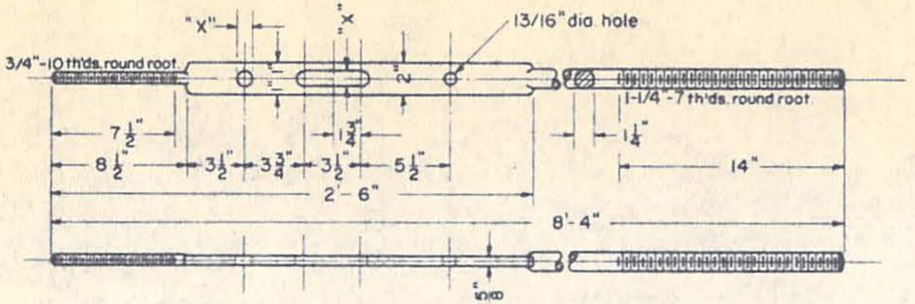
Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LOCK RODS
Office of Signal Engineer
Baltimore, Md
Sept 24, 1953

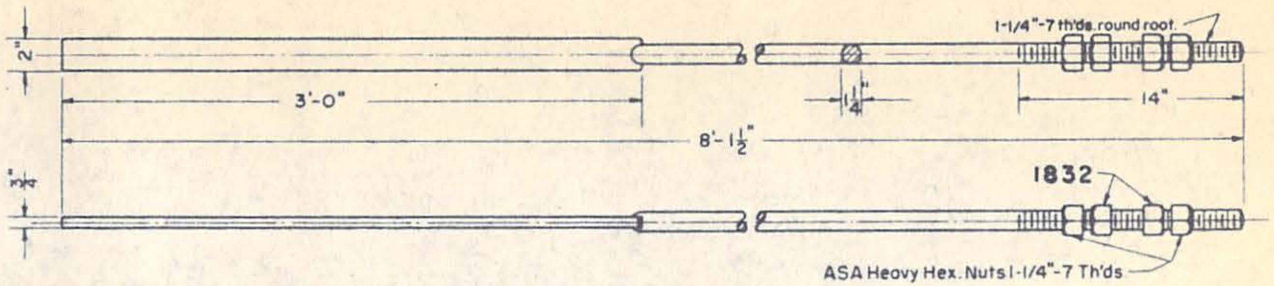
Adopted 1-12-54
5-13-54 Lock Rod Connecting Rod for "M2"-"M22" changed to 18
Revised 5-17-55

Sheet No. 1

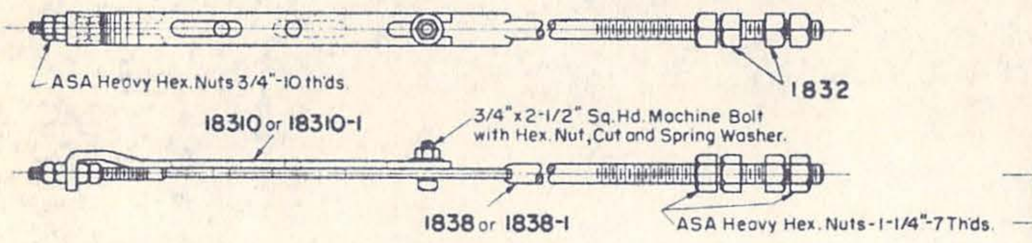
S-183-C


"X"
"X"
13/16" dia. hole
3/4"-10 th'ds. round root
1-1/4"-7 th'ds. round root
2"
7 1/2"
1 3/4"
1 1/4"
8 1/2"
3 1/2"
3 3/4"
3 1/2"
5 1/2"
14"
2'-6"
8'-4"
5/8"

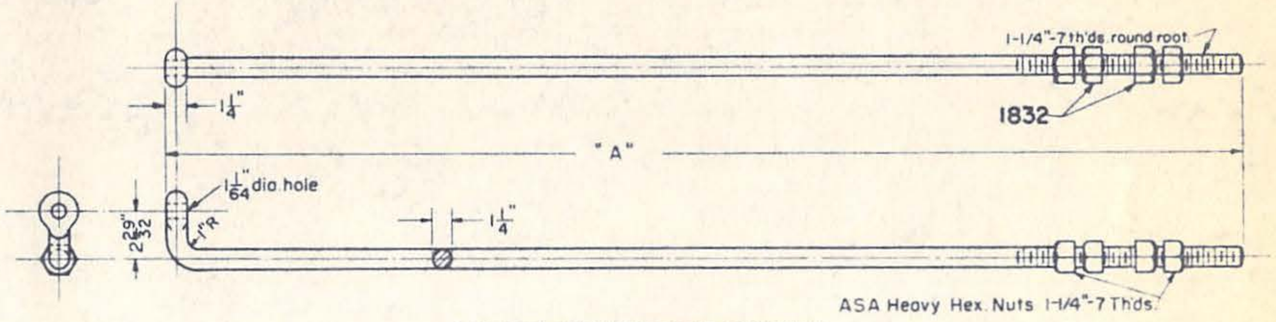
LOCK ROD ("X"=1"dia.) - **1838**
LOCK ROD ("X"=1-1/8"dia.)-**1838-1**
C-1020 Steel


2"
1-1/4"-7 th'ds. round root.
3'-0"
1 1/4"
14"
8'-1 1/2"
3/4"
1832
ASA Heavy Hex. Nuts 1-1/4"-7 Th'ds.

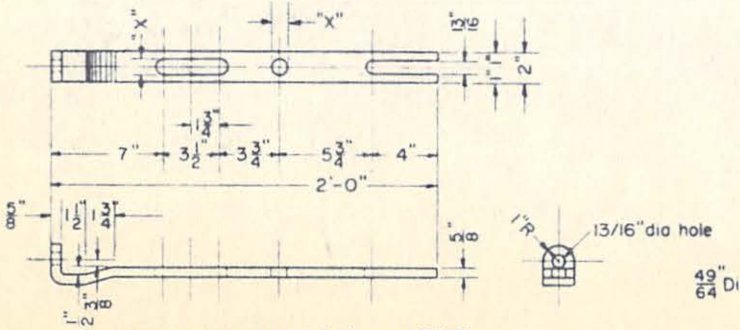
SINGLE LOCK ROD ASSEMBLY (for 9A Switch Lock, Dwg. S-170-B) - **18311**
G.R.S. No. 14094-20
C-1020 Steel


ASA Heavy Hex. Nuts 3/4"-10 th'ds.
1832
18310 or 18310-1
3/4"x2-1/2" Sq. Hd. Machine Bolt with Hex. Nut, Cut and Spring Washer.
1838 or 1838-1
ASA Heavy Hex. Nuts-1-1/4"-7 Th'ds.

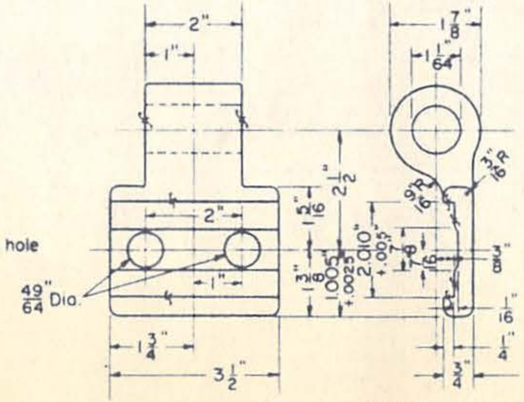
ADJUSTABLE LOCK ROD ASSEMBLY WITH 1838 & 18310 (for 9A Switch Lock, Dwg. S-170-A) - **1839**
ADJUSTABLE LOCK ROD ASSEMBLY WITH 1838-1 & 18310-1 (for 9B Switch Lock, Dwg. S-169) - **1839-1**


1-1/4"-7 th'ds. round root.
1 1/4"
1832
"A"
1 1/64" dia. hole
2 29/32"
1"R
1 1/4"
ASA Heavy Hex. Nuts 1-1/4"-7 Th'ds.

LOCK ROD CONNECTING ROD ASSEMBLY
"A"= 5'-5" (When "X" = 4'-0") Dwgs. S-165, S-166, S-167 - **18313**
A = 8'-5" (When "X" = 7'-0") Dwgs. S-165, S-166, S-167 - **18314**
C-1020 Steel


"X"
"X"
13/16"
1"
2"
1 3/4"
7"
3 1/2"
3 3/4"
5 3/4"
4"
2'-0"
3/8"
1 1/2"
1 3/4"
5/8"
1"R
13/16" dia hole
1/2"
3/8"

ADJUSTING PLATE ("X"=1"dia.) - **18310**
ADJUSTING PLATE ("X"=1-1/8"dia.) - **18310-1**
C-1020 Steel


2"
1"
1 7/8"
1 1/64"
2 1/2"
2"
5/16"
1"
49/64" Dia.
1 3/8"
1.005" +.0025
2.010" +.005
3/4"
1/16"
1/4"
1 3/4"
3 1/2"
3/4"

LOCK ROD LUG - **18312**
G.R.S. No. 30908-14
Material: Malleable Iron

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

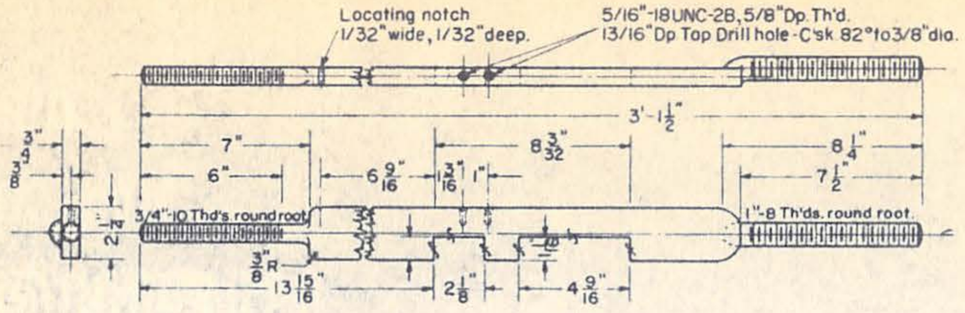
Lock Rod Assemblies will be furnished with Nuts unless otherwise specified.

Approved: C. Riley
Chief Eng'r. Maintenance

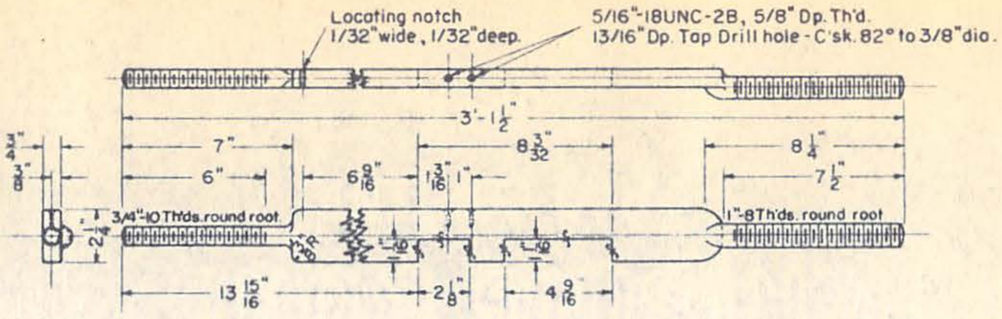
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LOCK RODS
Office of Signal Engineer
Baltimore, Md.
Sept 18, 1953

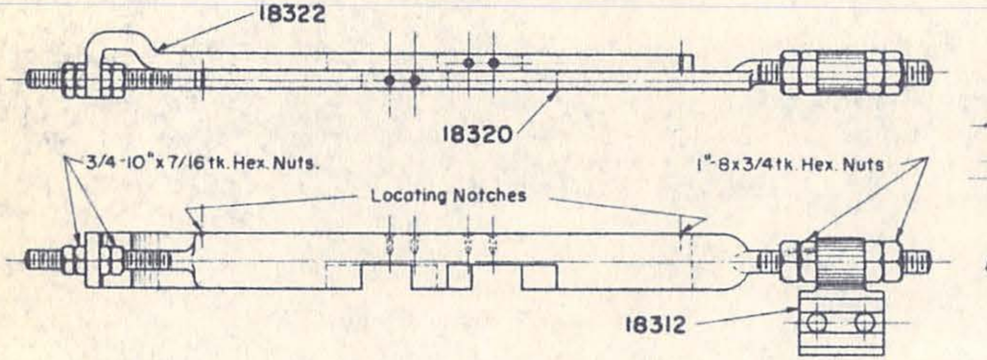
Adopted: 1-12-54.
5-13-54. Lock Rod Connecting Rod for "M2"-"M22" changed to 183
Revised: 5.17.55.


Locating notch
1/32" wide, 1/32" deep.
5/16"-18UNC-2B, 5/8" Dp. Th'd.
13/16" Dp Tap Drill hole - C'sk. 82° to 3/8" dia.
3'-1½"
7"
6"
8 3/32"
6 9/16"
1 3/16"
1"
8¼"
7½"
3/4"
3/8"
3/4"-10 Thd's round root
1"-8 Th'ds. round root.
2¼"
3/8" R
13 15/16"
2⅛"
4 9/16"

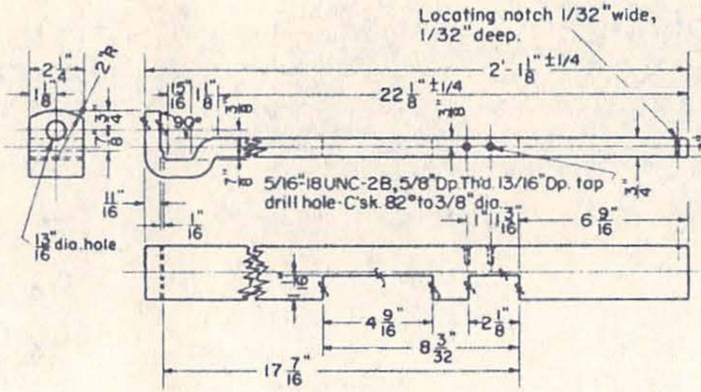
ADJUSTABLE LOCK ROD (for left hand movement) -18320
Material: AISI-1335-CD Steel.
G.R.S. No. 45519-6.


Locating notch
1/32" wide, 1/32" deep.
5/16"-18UNC-2B, 5/8" Dp. Th'd.
13/16" Dp. Tap Drill hole - C'sk. 82° to 3/8" dia.
3'-1½"
7"
6"
8 3/32"
6 9/16"
1 3/16"
1"
8¼"
7½"
3/4"
3/8"
3/4"-10 Th'ds. round root.
1"-8 Th'ds. round root
2¼"
3/8" R
13 15/16"
2⅛"
4 9/16"

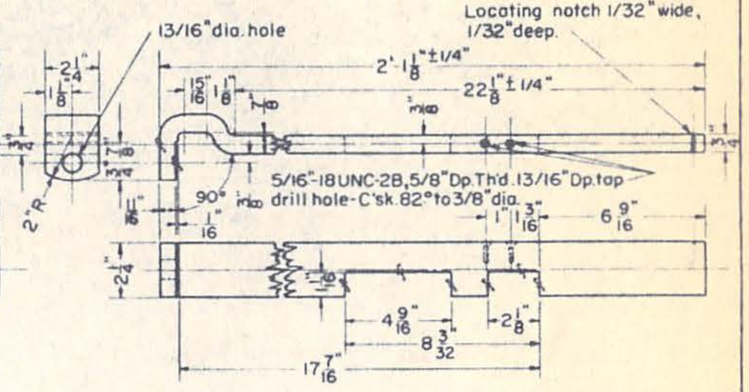
ADJUSTABLE LOCK ROD (for right hand movement) -18321
Material: AISI-1335 CD Steel
G.R.S. No. 45519-5


18322
18320
3/4-10" x 7/16 tk. Hex. Nuts.
1"-8 x 3/4 tk. Hex. Nuts
Locating Notches
18312

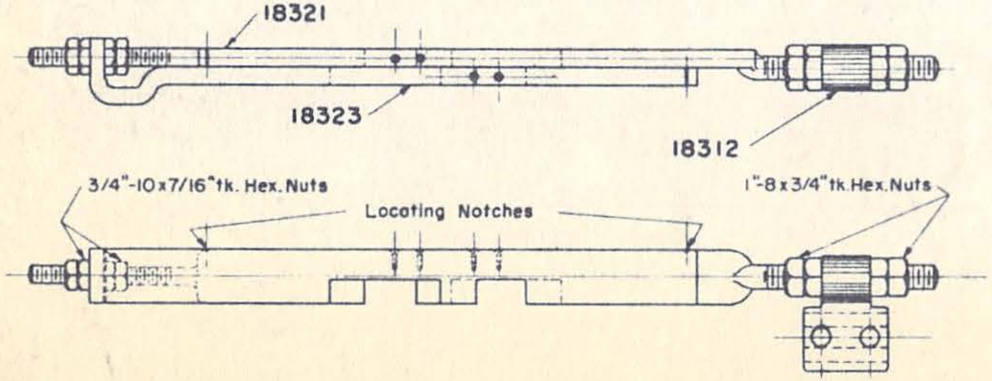
ADJUSTABLE LOCK ROD ASSEMBLY (for left hand movement) -18324
(5A-B-C and D Switch Machines)


Locating notch 1/32" wide,
1/32" deep.
2'-1⅛" ±1/4
22⅛" ±1/4
2¼"
1⅛"
2" R
15/16"
1⅛"
90°
5/16"-18UNC-2B, 5/8" Dp. Th'd. 13/16" Dp. tap drill hole - C'sk. 82° to 3/8" dia.
11/16"
1/16"
13/16" dia. hole
1"
1 3/16"
6 9/16"
4 9/16"
2⅛"
8 3/32"
17 7/16"

ADJUSTING PLATE (for right hand movement) -18323
Material: AISI-1335 C D Steel
G.R.S. No. 45525-5


13/16" dia. hole
Locating notch 1/32" wide,
1/32" deep.
2'-1⅛" ±1/4"
22⅛" ± 1/4"
2¼"
1⅛"
2" R
15/16"
1⅛"
90°
5/16"-18UNC-2B, 5/8" Dp. Th'd. 13/16" Dp. tap drill hole - C'sk. 82° to 3/8" dia.
1/16"
1"
1 3/16"
6 9/16"
2¼"
4 9/16"
2⅛"
8 3/32"
17 7/16"

ADJUSTING PLATE (for left hand movement) -18322
Material: AISI-1335 C D Steel
G.R.S. No. 45525-4


18321
18323
18312
3/4"-10 x 7/16" tk. Hex. Nuts
1"-8 x 3/4" tk. Hex. Nuts
Locating Notches

ADJUSTABLE LOCK ROD ASSEMBLY (for right hand movement) -18325
(5A-B-C and D Switch Machines)

Notes:

Movable Point Frog Layout, Signal Standard Plan No. S-217 requires, one Adjustable Lock Rod Assembly No. 18324 and one Adjustable Lock Rod Assembly No. 18325 for right or left hand movement.

Order must specify whether brackets are required with lock rods for Models 5A & B switch machines.

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2, round root, except where otherwise shown.

Approved: C. Riley
Chief Eng'r. Maintenance

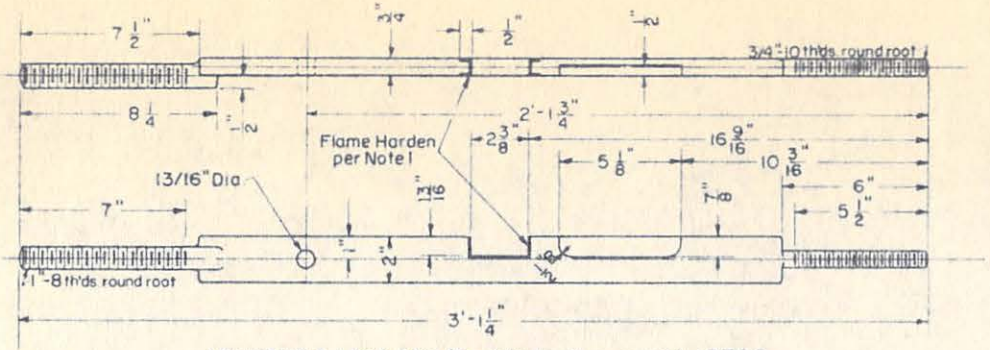
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LOCK RODS
Office of Signal Engineer
Baltimore, Md.
Oct. 20, 1952

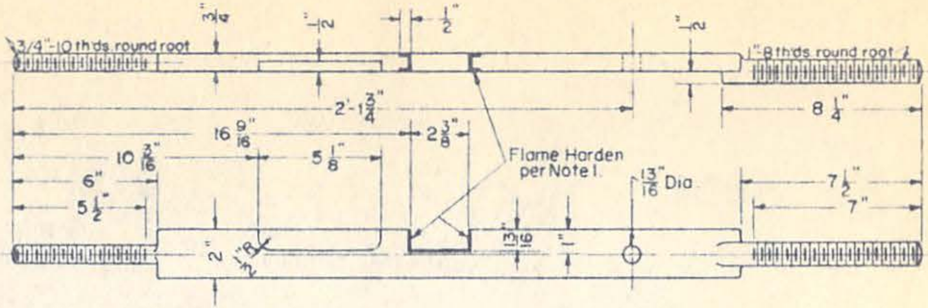
Sheet No. 3

S-183-C

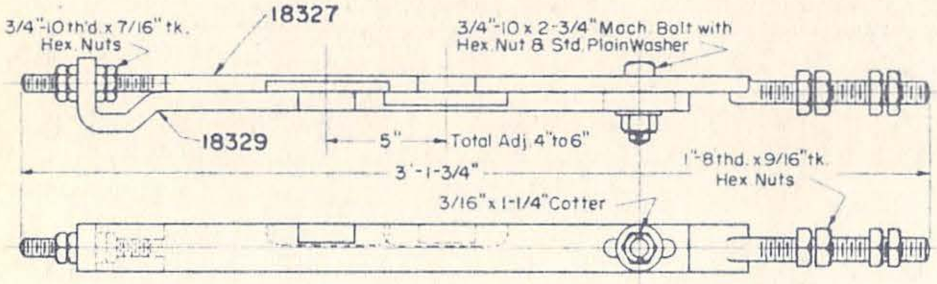
Adopted: 1-12-54.
5-13-54: Lock Rod Connecting Rod for "M2"-"M22" changed to 1836.
1-19-55: Position of Lug No. 18312 on Assembly 18325 changed.
Revised: 5-17-55.


7 1/2"
3/4"
1/2"
1/2"
3/4"-10 th'ds round root
8 1/4
1/2
2'-1 3/4"
Flame Harden per Note 1
2 3/8"
16 9/16"
5 1/8"
10 3/16"
13/16" Dia
13/16
7/8
6"
7"
5 1/2"
1"
2"
1/2R
1"-8 th'ds round root
3'-1 1/4"

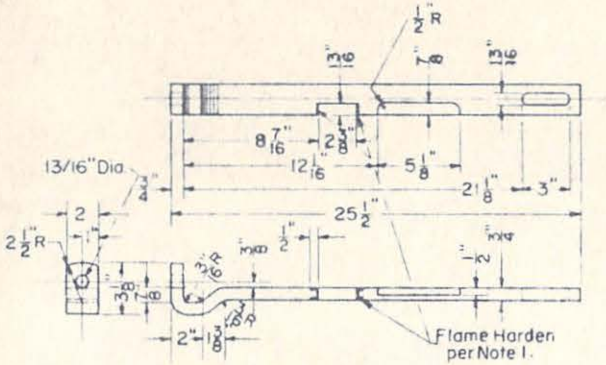
ADJUSTABLE LOCK ROD (for right hand movement) - **18326**
G.R.S. No. 50842-13
Material C-1335


3/4"
1/2
1/2"
1/2
3/4"-10 th'ds round root
1"-8 th'ds round root
2'-1 3/4"
8 1/4"
16 9/16
2 3/8"
10 3/16
5 1/8"
Flame Harden per Note 1.
13/16 Dia
6"
7 1/2"
5 1/2"
7"
2"
1/2R
13/16
1"

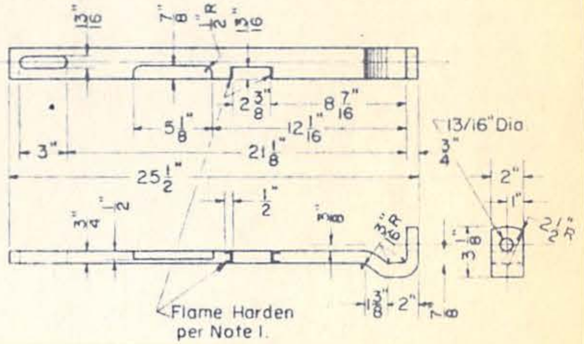
ADJUSTABLE LOCK ROD (for left hand movement) - **18327**
G.R.S. No. 50842-19
Material: C-1335


3/4"-10 th'd. x 7/16" tk. Hex. Nuts
18327
3/4"-10 x 2-3/4" Mach. Bolt with Hex. Nut & Std. Plain Washer
18329
5"
Total Adj. 4" to 6"
3'-1-3/4"
1"-8 thd. x 9/16" tk. Hex. Nuts
3/16" x 1-1/4" Cotter

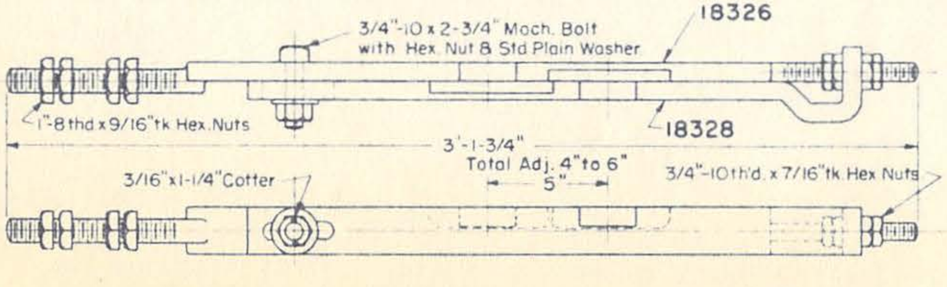
ADJUSTABLE LOCK ROD ASSEMBLY (for left hand movement) - **18330**
G.R.S. No. 50840-11
(Model 9 Hand Operated Switch Machine)


1/2R
13/16
7/8
13/16
8 7/16"
2 3/8"
12 1/16"
5 1/8"
13/16" Dia
3/4"
21 1/8"
3"
25 1/2"
2
1"
2 1/2R
3/8
7/8
3/16R
1/2"
3/4
1/2
2"
1 3/8"
Flame Harden per Note 1.

ADJUSTABLE LOCK ROD (for left hand movement) **18329**
G.R.S. No. 50841-3


13/16
7/8
1/2R
13/16
2 3/8"
8 7/16"
5 1/8"
12 1/16"
13/16" Dia
3"
21 1/8"
3/4"
25 1/2"
2"
1"
3/4
1/2
1/2"
2 1/2R
3/8
3/16R
1 3/8"
2"
7/8
Flame Harden per Note 1.

ADJUSTABLE LOCK ROD (for right hand movement) - **18328**
G.R.S. No. 50841-1


3/4"-10 x 2-3/4" Mach. Bolt with Hex. Nut & Std. Plain Washer
18326
1"-8 thd x 9/16" tk Hex. Nuts
18328
3'-1-3/4"
Total Adj. 4" to 6"
5"
3/16" x 1-1/4" Cotter
3/4"-10 th'd. x 7/16" tk. Hex Nuts

ADJUSTABLE LOCK ROD ASSEMBLY (for right hand movement) - **18331**
G.R.S. No. 50840-9
(Model 9 Hand Operated Switch Machine)

Approved A. Riley
Chief Eng'r. Maintenance

Approved A. L. Jordan
Signal Engineer

Notes:-

1- Flame harden, as indicated, approx. 1/8" deep, per HTS 5-23 Stress Relieve at 350°-400°F. HARDNESS - Rockwell C-50 (Min.)

2- Threaded ends and portions which have been subjected to forging operations to be normalized

3- All threads shall be NC-2

BALTIMORE & OHIO RAILROAD

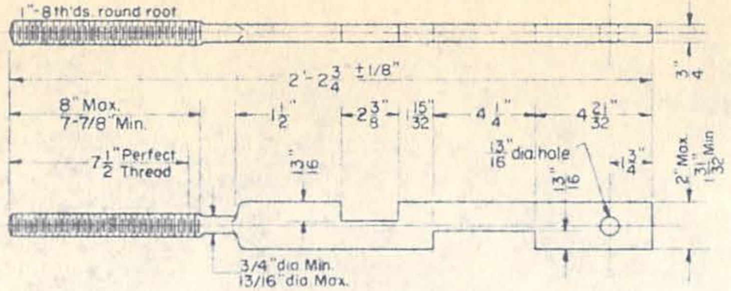
LOCK RODS

Office of Signal Engineer
Baltimore, Md.
Aug 7, 1953

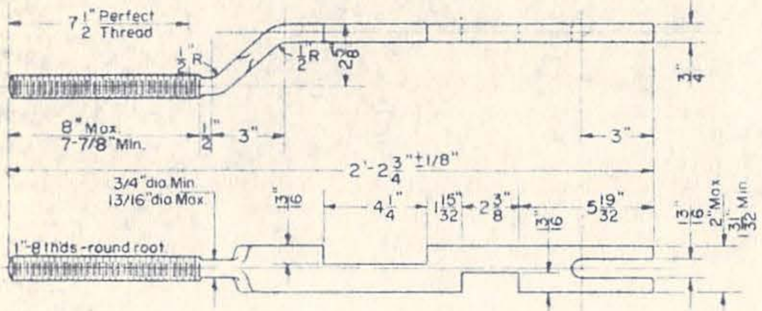
Sheet No. 4

S-183-C

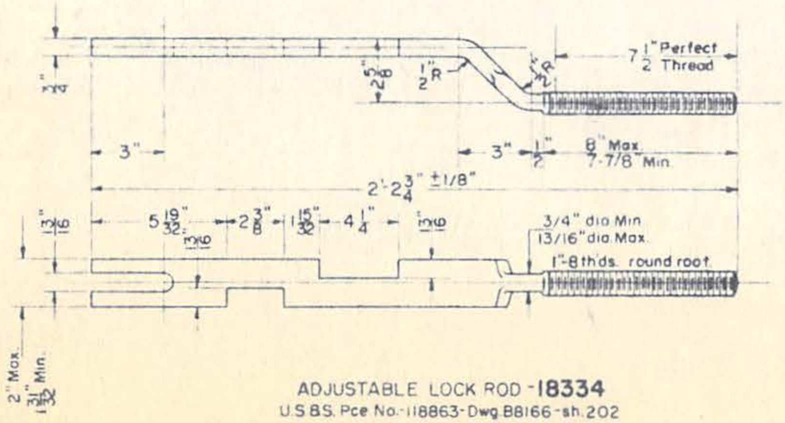
Adopted 1-12-54
5-13-54 Lock Rod Connecting Rod to "M2"-"M22" changed to 1836
Revised 5-17-55


1"-8 th'ds. round root
2'-2 3/4" ±1/8"
3/4"
8" Max.
7-7/8" Min.
1 1/2"
2 3/8"
15/32"
4 1/4"
4 21/32"
7 1/2" Perfect Thread
13/16
13/16" dia. hole
13/16"
1 3/4"
2" Max.
1 31/32" Min.
3/4" dia Min.
13/16" dia Max.

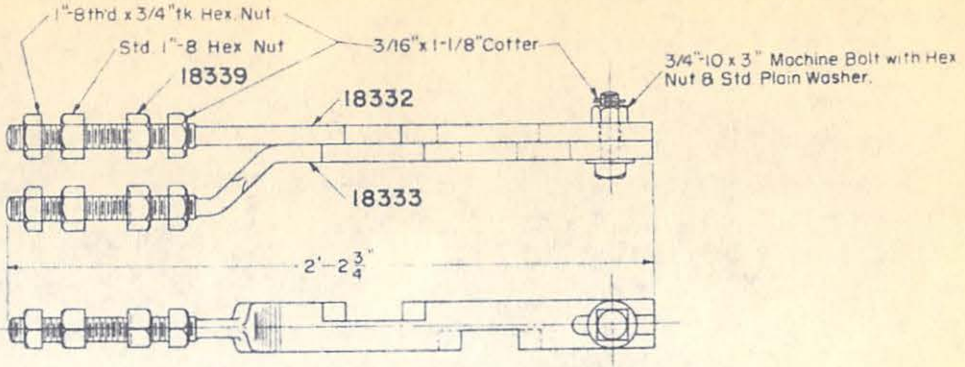
ADJUSTABLE LOCK ROD - **18332**
U.S.&S. Pce. No. 118861 - Dwg. B8166 - sh. 202


7 1/2" Perfect Thread
3/4" R
1/2" R
2 5/8"
3/4"
8" Max.
7-7/8" Min.
1/4"
3"
3"
2'-2 3/4" ±1/8"
3/4" dia Min.
13/16" dia Max.
13/16
4 1/4"
1 15/32"
2 3/8"
13/16
5 19/32"
13/16
2" Max
1 31/32" Min
1"-8 th'ds - round root

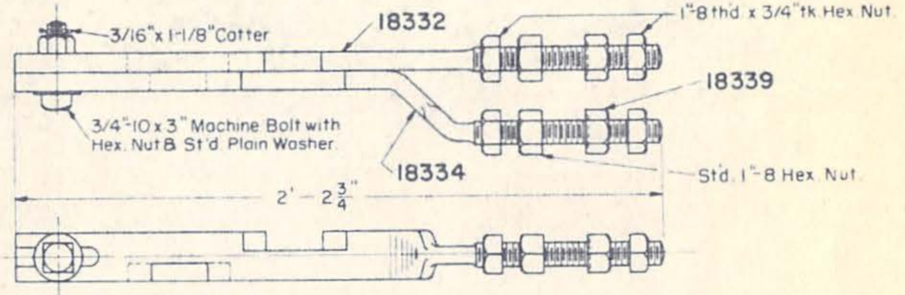
ADJUSTABLE LOCK ROD - **18333**
U.S.&S. Pce. No. 118862 - Dwg. B8166 - sh. 202


3/4"
2 5/8"
1/2" R
3/4" R
7 1/2" Perfect Thread
3"
3"
1/2"
8" Max.
7-7/8" Min.
2'-2 3/4" ±1/8"
13/16
5 19/32"
13/16
2 3/8"
1 15/32"
4 1/4"
13/16
3/4" dia Min.
13/16" dia Max.
1"-8 th'ds. round root
2" Max.
1 31/32" Min.

ADJUSTABLE LOCK ROD - **18334**
U.S.&S. Pce. No. 118863 - Dwg. B8166 - sh. 202


1"-8 th'd x 3/4" tk. Hex. Nut
Std. 1"-8 Hex Nut
18339
3/16" x 1-1/8" Cotter
3/4"-10 x 3" Machine Bolt with Hex Nut & Std. Plain Washer.
18332
18333
2'-2 3/4"

ADJUSTABLE LOCK ROD ASSEMBLY - (for right hand movement) - **18335**
U.S.&S. Pce. No. 118864 - Dwg. B8166 - sh. 203
(for Style "A1" and "A5" E.P. Switch Machines)


3/16" x 1-1/8" Cotter
18332
1"-8 th'd x 3/4" tk. Hex. Nut
18339
3/4"-10 x 3" Machine Bolt with Hex. Nut & St'd. Plain Washer.
18334
Std. 1"-8 Hex. Nut
2'-2 3/4"

ADJUSTABLE LOCK ROD ASSEMBLY (for left hand movement) - **18336**
U.S.&S. Pce. No. 118865 - Dwg. B8166 - sh. 203
(for Style "A1" and "A5" E.P. Switch Machines)

Approved ______ Chief Eng'r. Maintenance

Approved A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
LOCK RODS
Office of Signal Engineer
Baltimore, Md.
May 12, 1954

Notes:

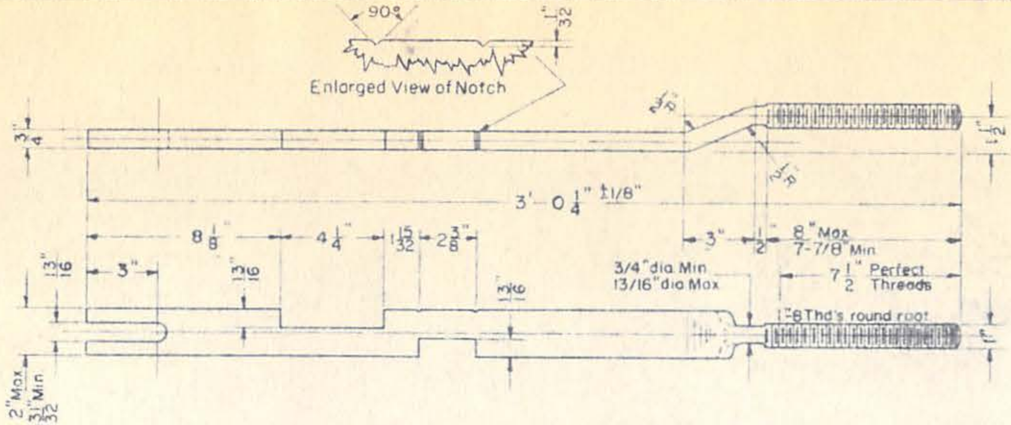
Threaded ends and portions which have been subjected to forging operations to be normalized

All threads shall be NC-2, round root.

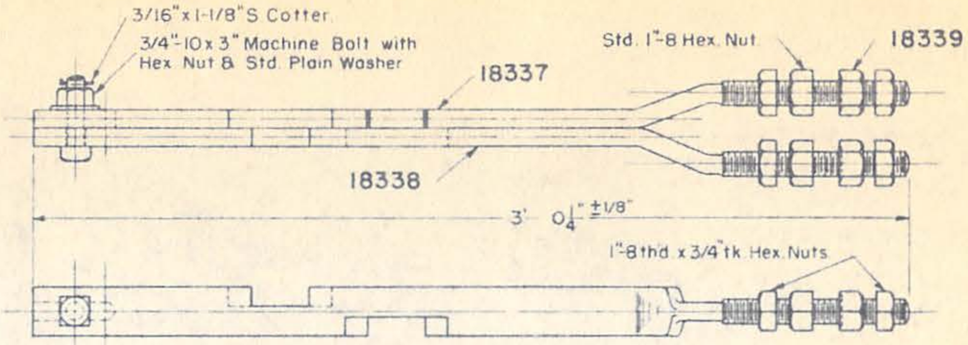
Adopted 1-12-54.
Revised 5-17-55.

Sheet No. 5

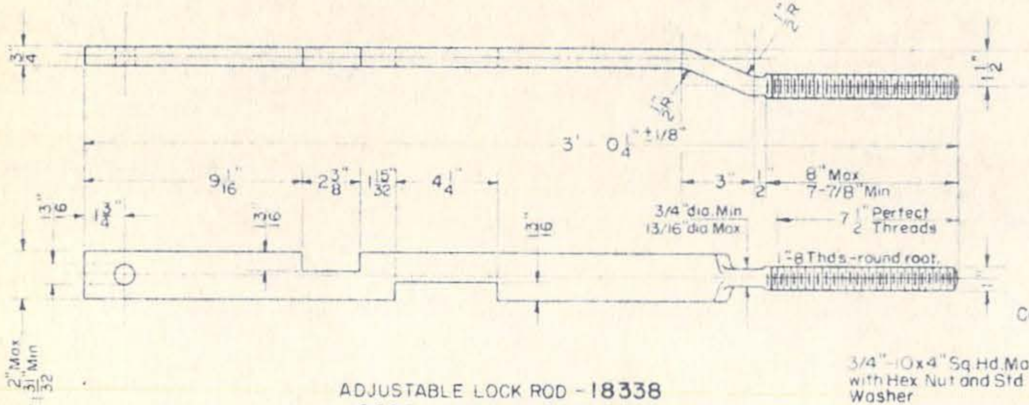
S-183-C


90°
1/32"
Enlarged View of Notch
3/4"
1/2 R
1 1/2"
3'- 0 1/4" ±1/8"
8 1/8"
4 1/4"
1 15/32"
2 3/8"
3"
1/2"
8" Max
7-7/8" Min
13/16"
3"
3/16
3/4" dia Min
13/16" dia Max
7 1/2" Perfect Threads
1"-8 Thd's round root
1"
2" Max
1 31/32" Min

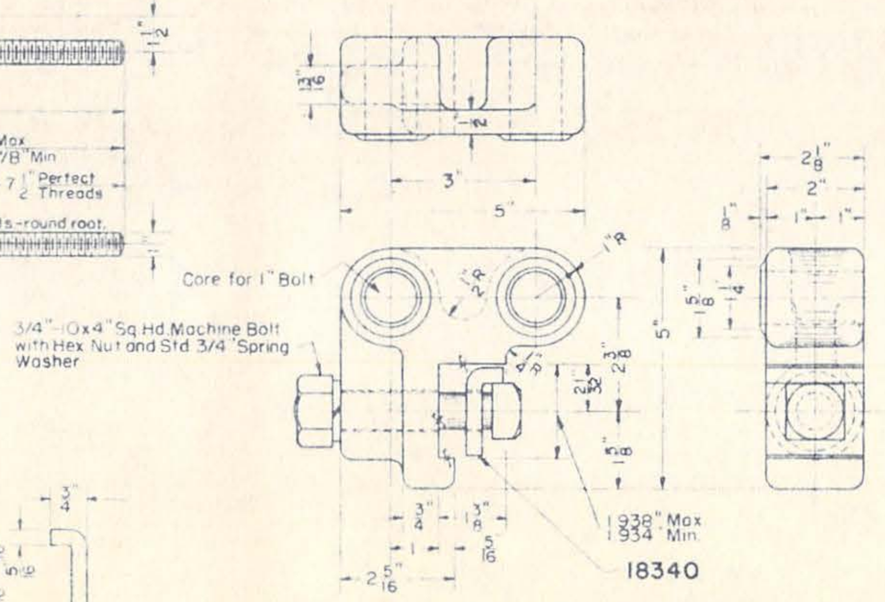
ADJUSTABLE LOCK ROD - **18337**
U.S.&S. Pce 149864-Dwg. B8166-sh. 268


3/16" x 1-1/8" S Cotter
3/4"-10 x 3" Machine Bolt with Hex Nut & Std. Plain Washer
18337
Std. 1"-8 Hex. Nut
18339
18338
3'- 0 1/4" ±1/8"
1"-8 thd x 3/4" tk Hex. Nuts

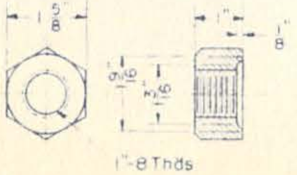
ADJUSTABLE LOCK ROD ASSEMBLY - **18342**
U.S.&S. Pce 149866-Dwg. B8166-sh. 268.
(for R.H. or L.H. Style "M2" or "M22" A&B Switch Layout S-161
and Style "M3" or "M23" A&B.)


3/4"
1/2 R
1 1/2"
1/2 R
3'- 0 1/4" ±1/8"
9 1/16"
2 3/8"
1 15/32"
4 1/4"
3"
1/2"
8" Max
7-7/8" Min
13/16"
1 3/4"
3/16
3/4" dia Min
13/16" dia Max
7 1/2" Perfect Threads
1"-8 Thds - round root
2" Max
1 31/32" Min

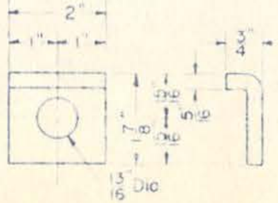
ADJUSTABLE LOCK ROD - **18338**
U.S.&S. Pce 149865 -Dwg. 8166- sh. 268


13/16
1/2
3"
5"
2 1/8"
2"
1/8"
1"
1"
1" R
1/2 R
Core for 1" Bolt
3/4"-10 x 4" Sq. Hd. Machine Bolt with Hex Nut and Std. 3/4" Spring Washer
1/4 R
5/8
1/4
5"
2 3/8"
21/32
5/8"
3/4"
1 3/8"
1
5/16
2 5/16"
1.938" Max
1.934" Min
18340

LOCK ROD LUG ASSEMBLY - **18341**
U.S.&S. Pce 123471 - Dwg. B8060 - sh. 25


1 5/8"
1"
1/8"
9/16
3 1/16"
1"-8 Thds

CUPPED NUT - **18339**
U.S.&S. Pce 117153-Dwg. 8265 - sh. 209


2"
1"
1"
3/4"
5/16
7/8
5/16
5/16
13/16" Dia

WASHER - **18340**
U.S.&S. Pce 117198-Dwg. 7826-sh. 238.

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized

All threads shall be NC-2, round root

Approved [illegible]
Chief Eng'r. Maintenance

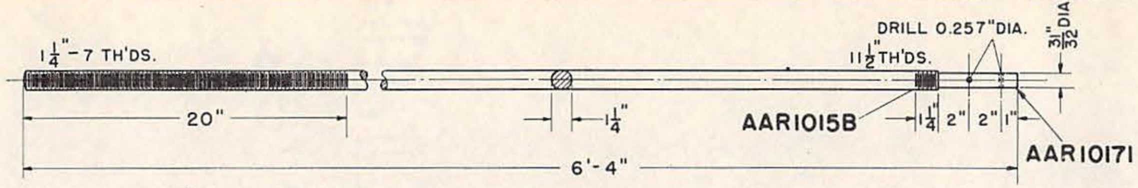
Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LOCK RODS
Office of Signal Engineer
Baltimore, Md.
May 12, 1954

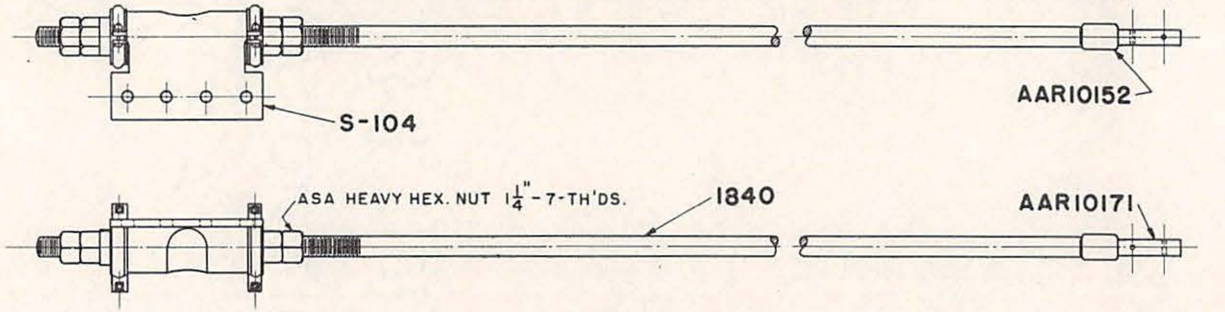
Sheet No. 6

S-183-C

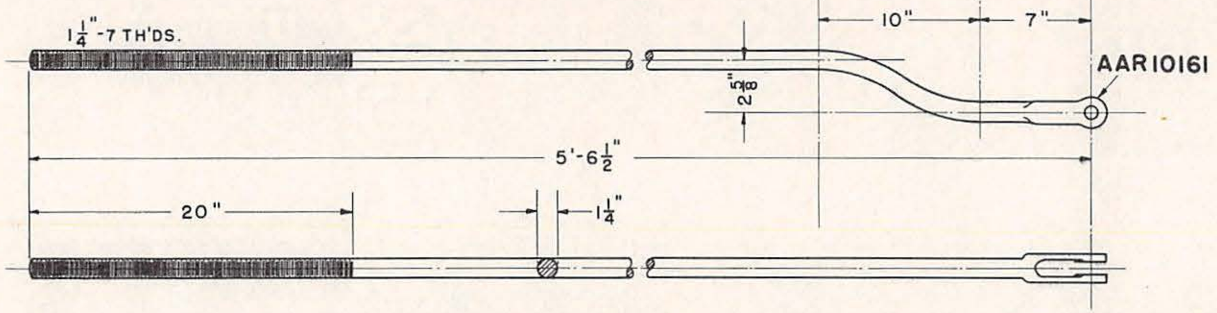
Revised 5-7-55


1¼"-7 TH'DS.
DRILL 0.257"DIA.
1½"TH'DS.
31/32" DIA.
20"
1¼"
AAR1015B
1¼"
2"
2"
1"
AAR10171
6'-4"

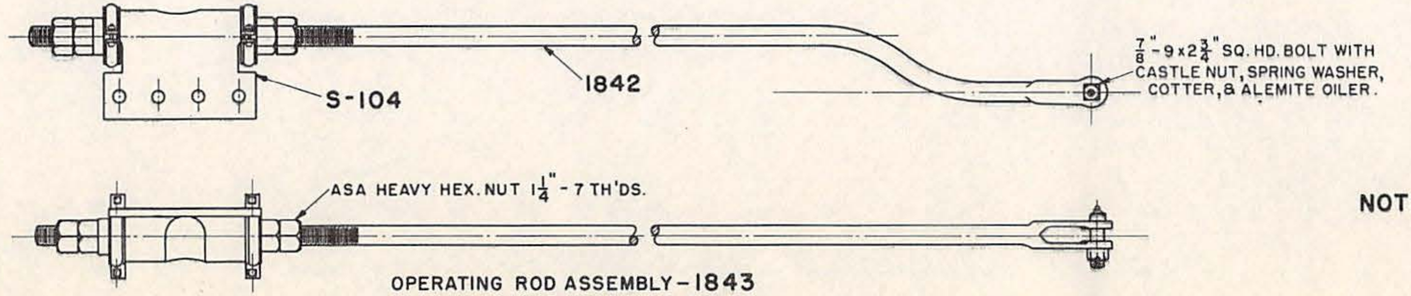
OPERATING ROD - 1840
SAE 1335 STEEL FORGED WITHOUT WELDS


S-104
AAR10152
ASA HEAVY HEX. NUT 1¼"-7-TH'DS.
1840
AAR10171

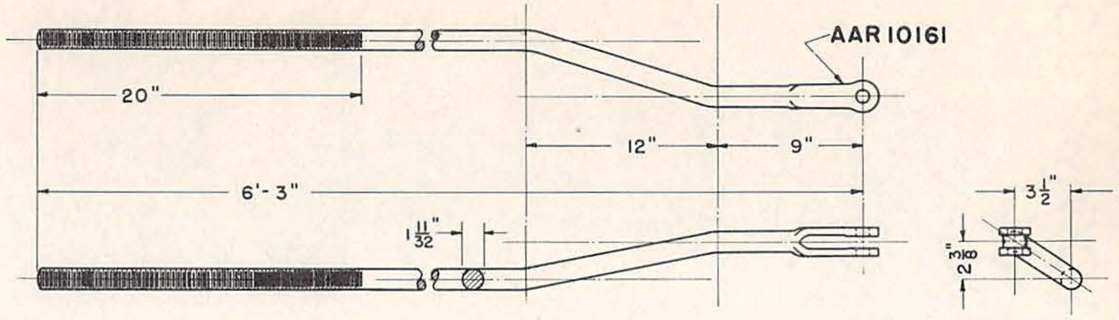
OPERATING ROD ASSEMBLY - 1841
(for Mechanical Switch Dwg. S-136)


1¼"-7 TH'DS.
10"
7"
2⅝"
AAR10161
5'-6½"
20"
1¼"

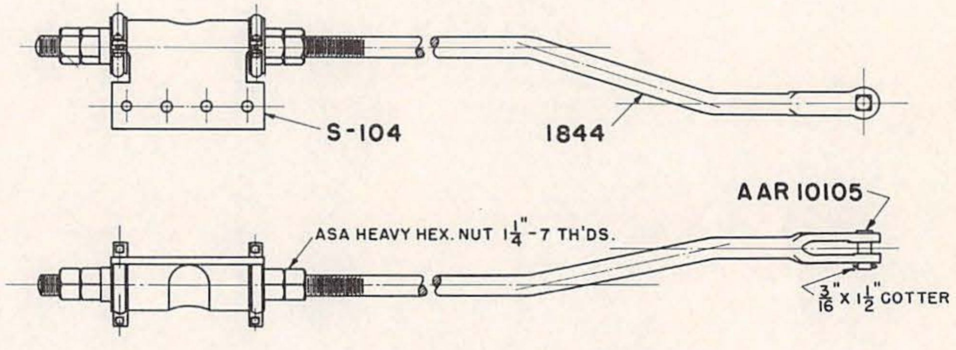
OPERATING ROD - 1842
SAE 1335 STEEL FORGED WITHOUT WELDS


S-104
1842
⅞"-9x2¾" SQ. HD. BOLT WITH CASTLE NUT, SPRING WASHER, COTTER, & ALEMITE OILER.
ASA HEAVY HEX. NUT 1¼"-7 TH'DS.

OPERATING ROD ASSEMBLY - 1843
(for 5A-B-C-D Switch Machines Dwg. S-147,
and Style "M2" or "M22" A&B S&L Movement Dwg. S-161)


AAR10161
20"
12"
9"
6'-3"
3½"
1 11/32"
2⅜"

OPERATING ROD - 1844
SAE 1035 STEEL FORGED WITHOUT WELDS


S-104
1844
AAR10105
ASA HEAVY HEX. NUT 1¼"-7 TH'DS.
3/16" x 1½" COTTER

OPERATING ROD ASSEMBLY - 1845
(for Style "A5" E.P.S. & L. Movement Dwg. S-160)

APPROVED: ________
CHIEF ENG'R. MAINTENANCE

APPROVED: ________
CHIEF ENG'R. COMM. & SIGS.

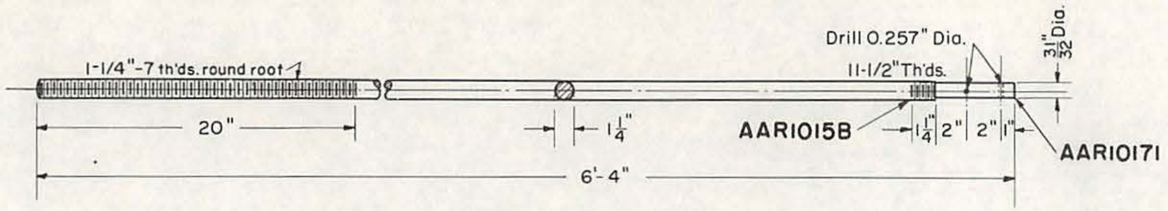
NOTES: All Threads to be NC-2

BALTIMORE & OHIO RAILROAD
OPERATING RODS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 22, 1949

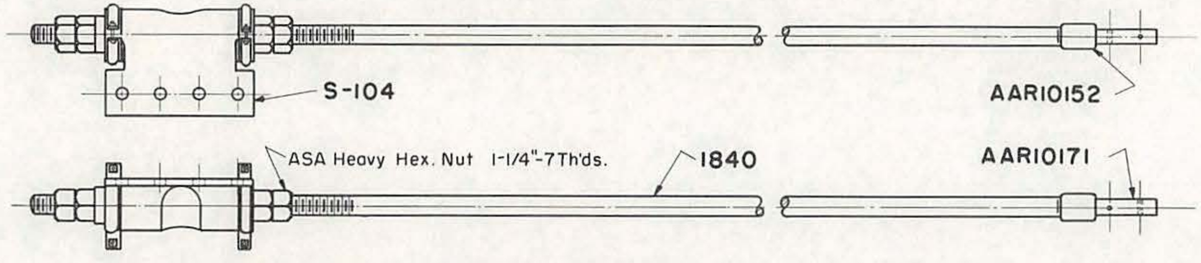
SHEET NO. 1

S-184-A

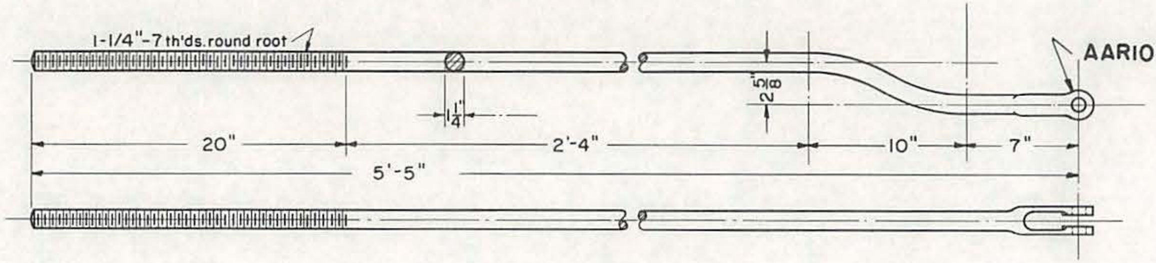
Adopted: 4-26-50.
Revised 9-20-50 account connecting bolt change.


1-1/4"-7 th'ds. round root
Drill 0.257" Dia.
11-1/2" Th'ds.
3 11/32" Dia.
20"
1 1/4"
AAR1015B
1 1/4"
2"
2"
1"
AAR10171
6'-4"

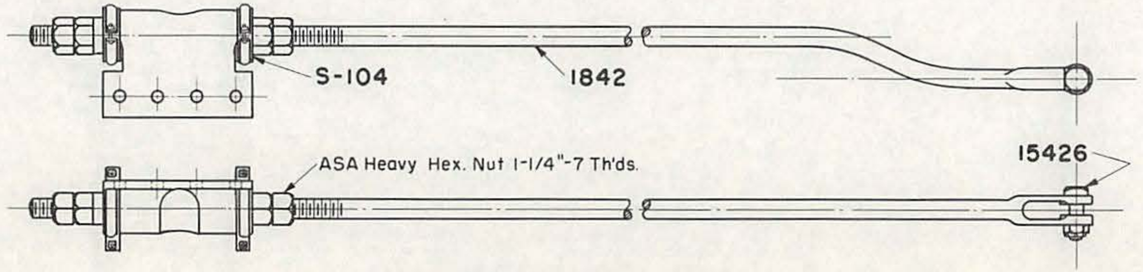
OPERATING ROD - **1840**
AISI-1335 Steel Forged without welds


S-104
AAR10152
ASA Heavy Hex. Nut 1-1/4"-7 Th'ds.
1840
AAR10171

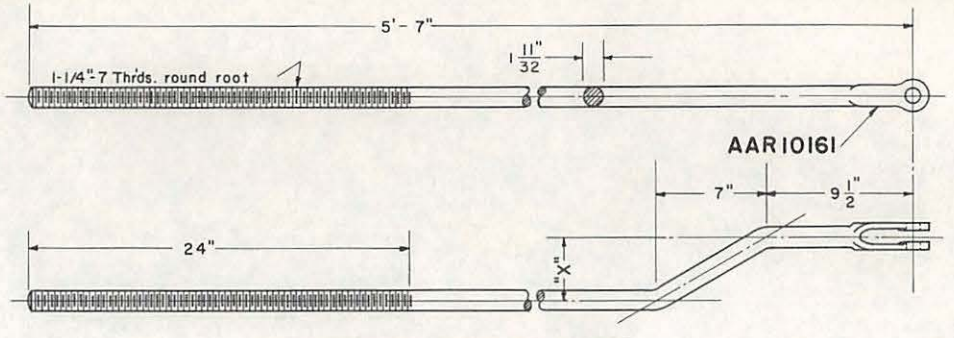
OPERATING ROD ASSEMBLY - **1841**
(for Mechanical Split Point Derail Dwg. S-135-E & Mechanical Switch Dwg. S-136-F.)


1-1/4"-7 th'ds. round root
AAR10161
2 5/8"
1 1/4"
20"
2'-4"
10"
7"
5'-5"

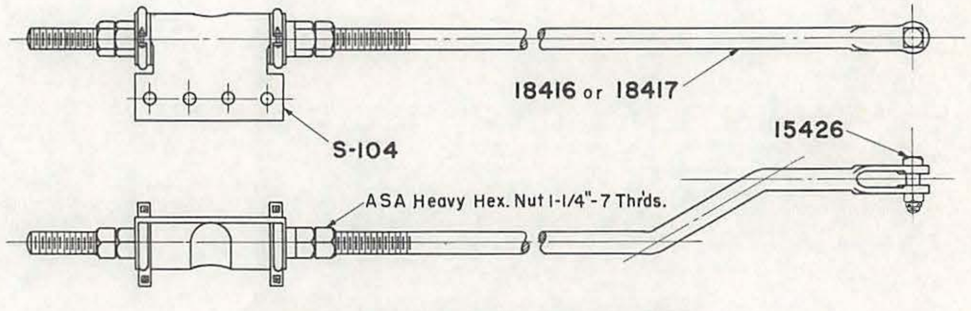
OPERATING ROD - **1842**
AISI-1335 Steel Forged without welds


S-104
1842
ASA Heavy Hex. Nut 1-1/4"-7 Th'ds.
15426

OPERATING ROD ASSEMBLY - **1843**
(for 5A-B-C-D Switch Machines Dwg. S-147-G &
Style "M2" or "M22" A & B S&L Movement Dwg. S-161-E)


5'-7"
1 11/32"
1-1/4"-7 Th'ds. round root
AAR10161
7"
9 1/2"
24"
"X"

OPERATING ROD ("X"= 4") - **18416**
OPERATING ROD ("X"= 2") - **18417**


18416 or 18417
S-104
15426
ASA Heavy Hex. Nut 1-1/4"-7 Th'ds.

OPERATING ROD ASSEMBLY (with 18416) - **18418**
(Used on Lap Switch with Model 6 Switch Machine Dwg. S-259-A)

OPERATING ROD ASSEMBLY (with 18417) **18419**
(Used on Single Switch with Model 6 Switch Machine)

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

Approved: Chief Engineer Construction & Maintenance

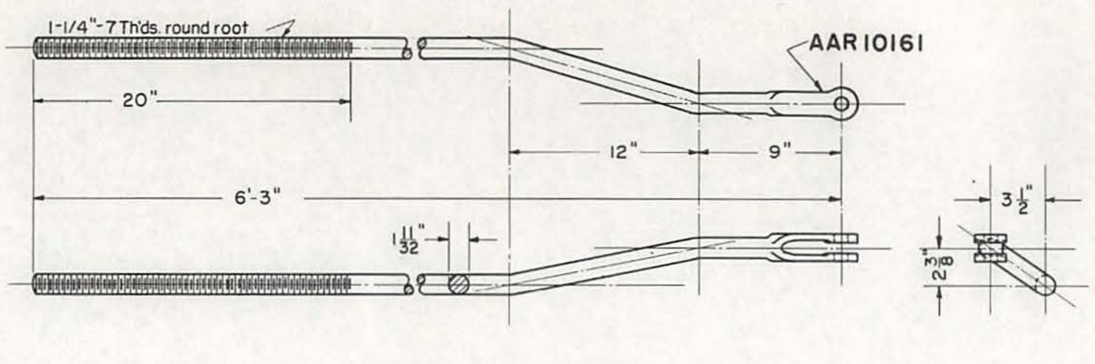
Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD
OPERATING RODS
Office of Signal Engineer
Baltimore, Md.
June 6, 1958

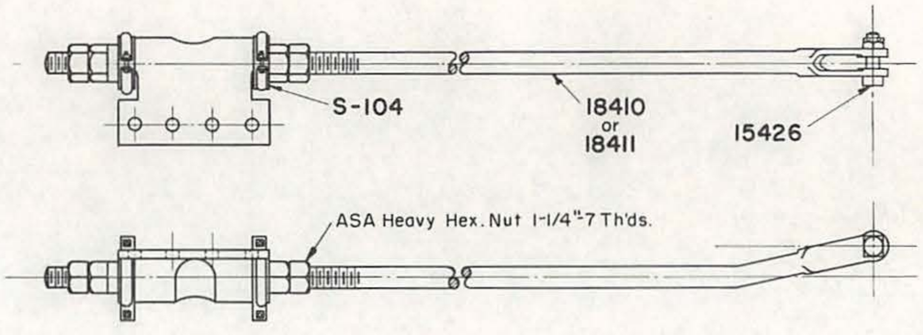
Sheet No. 1

S-184-D

Made & Corrected: 11-7-52
Adopted: 1-12-54
Revised: 6-27-58 Assembly's 18420 & 18421 added.

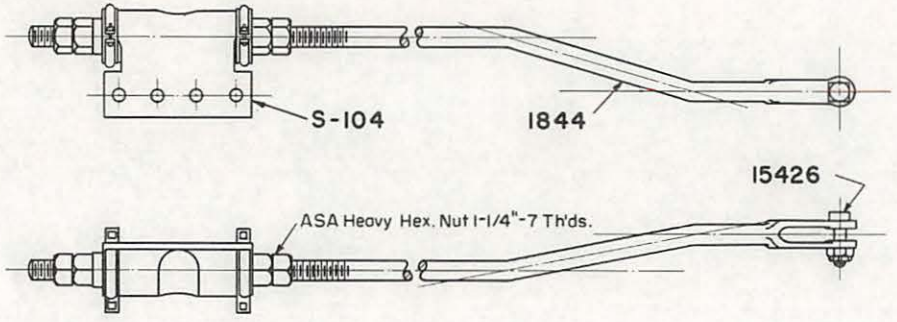

1-1/4"-7 Th'ds. round root
AAR 10161
20"
12"
9"
6'-3"
1 11/32"
3 1/2"
2 3/8"

OPERATING ROD - **1844**
C-1035 Steel Forged without welds

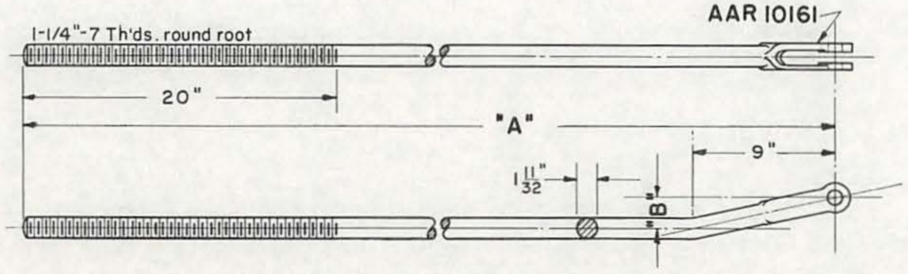

S-104
18410
or
18411
15426
ASA Heavy Hex. Nut 1-1/4"-7 Th'ds.

OPERATING ROD ASSEMBLY USING ROD - 18410 - **18412**
(Used on Lap Switch with Direct Acting Cylinder Dwg. S-240-A

OPERATING ROD ASSEMBLY USING ROD - 18411 - **18413**
(Used on Single Switch with Direct Acting Cylinder Dwg. S-240-A


S-104
1844
15426
ASA Heavy Hex. Nut 1-1/4"-7 Th'ds.

OPERATING ROD ASSEMBLY - **1845**
(for Style "A5" E.P.S.& L. Movement Dwg. S-160-D)


AAR 10161
1-1/4"-7 Th'ds. round root
20"
"A"
9"
1 11/32"
"B"

OPERATING ROD ("A"= 4'-9")("B"= 2") - **18410**

OPERATING ROD ("A"= 4'-6")("B"= 1-3/4") - **18411**
C-1035 Steel Forged without welds

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

Approved: A. Riley
Chief Engineer
Construction & Maintenance

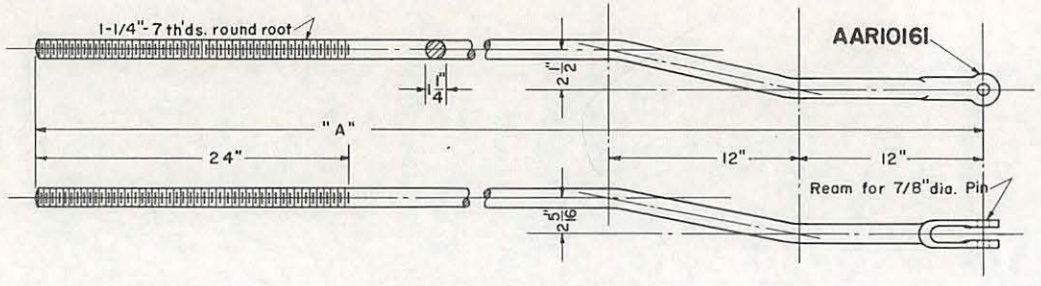
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
OPERATING RODS
Office of Signal Engineer
Baltimore, Md.
June 6, 1958

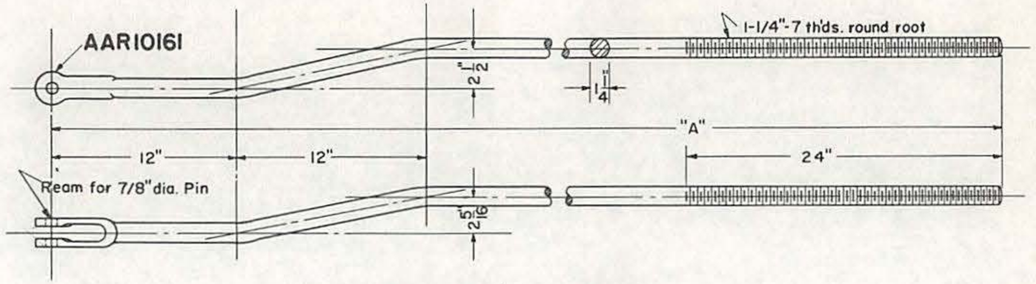
Made & Corrected 11-10-52
Adopted 1-12-54
Revised 6-27-58 Assemblys 18420 & 18421 added.

Sheet No. 2

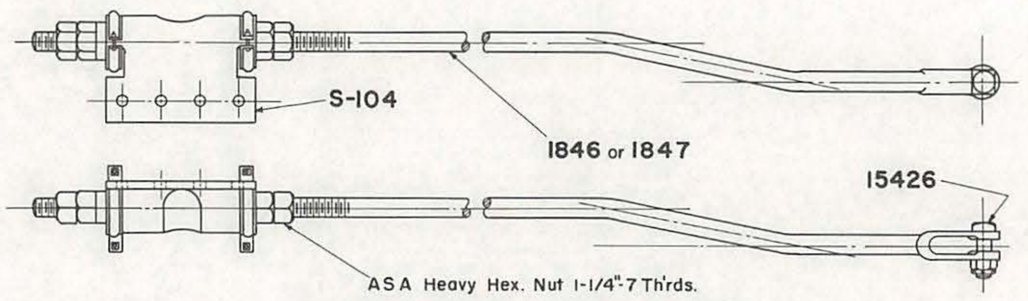
S-184-D


1-1/4"-7 th'ds. round root
AAR10161
1 1/4
2 1/2"
"A"
24"
12"
12"
Ream for 7/8" dia. Pin
2 5/16"

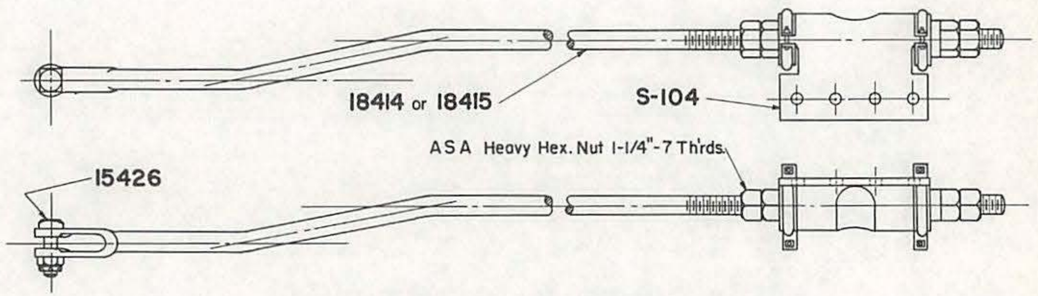
OPERATING ROD ("A"=7'-6") -**1846**
OPERATING ROD ("A"=10'-5") -**1847**
FOR R.H. LAYOUT
AISI-1335 Steel forged without welds


AAR10161
1-1/4"-7 th'ds. round root
2 1/2"
1 1/4
"A"
12"
12"
24"
Ream for 7/8" dia. Pin
2 5/16"

OPERATING ROD ("A"=7'-6") -**18414**
OPERATING ROD ("A"=10'-5") -**18415**
FOR L.H. LAYOUT
AISI-1335 Steel forged without welds


S-104
1846 or 1847
15426
ASA Heavy Hex. Nut 1-1/4"-7 Th'rds.

OPERATING ROD ASSEMBLY USING ROD 1846 -**1848**
OPERATING ROD ASSEMBLY USING ROD 1847 -**1849**
(for Model 9 Hand Operated Switch Machine Dwgs. S-165, S-166-C & 167-C)


18414 or 18415
S-104
ASA Heavy Hex. Nut 1-1/4"-7 Th'rds.
15426

OPERATING ROD ASSEMBLY USING ROD 18414-**18420**
OPERATING ROD ASSEMBLY USING ROD 18415-**18421**
(for Model 9 Hand Operated Switch Machine Dwgs. S-165, S-166-C & 167-C)

Notes:

Threaded ends and portions which have been subjected to forging operations to be normalized.

All threads shall be NC-2.

Approved: ORiley
Chief Engineer
Construction & Maintenance

Approved: A L Jordan
Signal Engineer

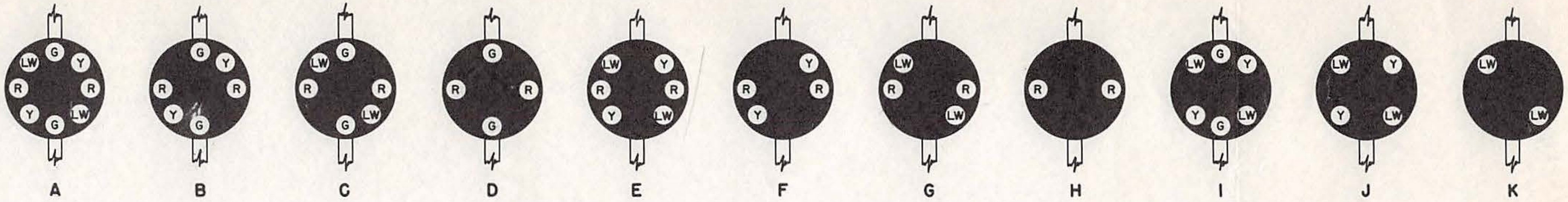
BALTIMORE & OHIO RAILROAD
OPERATING RODS
Office of Signal Engineer
Baltimore, Md.
June 27, 1958

W.J.G.

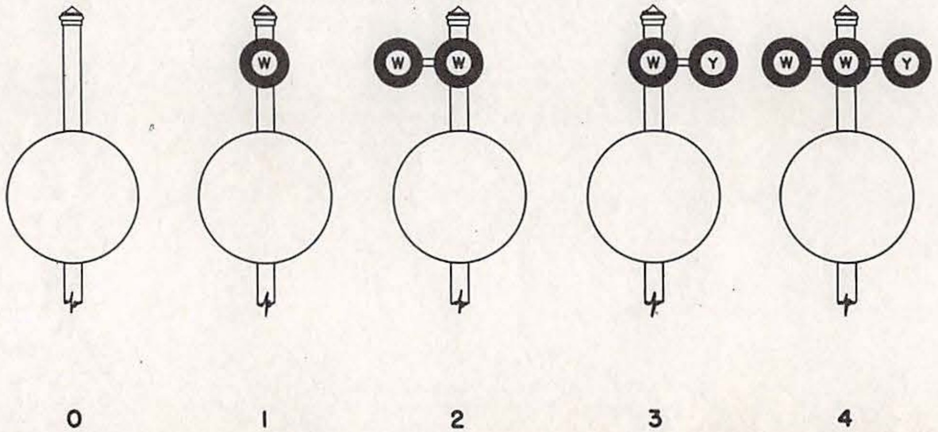
Sheet No.3

S-184-D

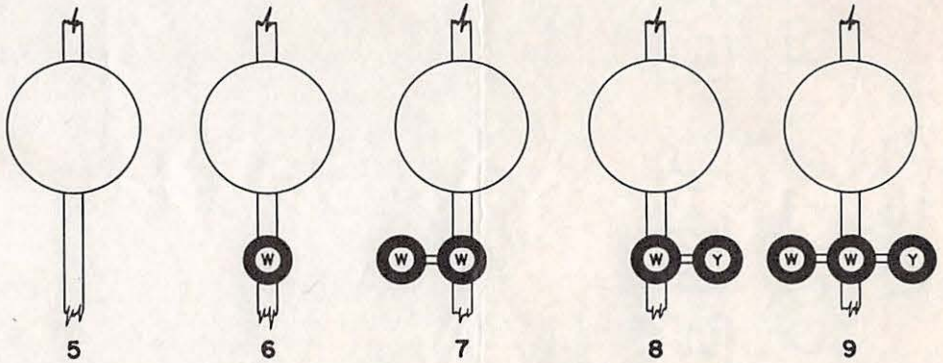
MAIN GROUP



TOP MARKER GROUP



BOTTOM MARKER GROUP



NOTES:

Signals shall conform to A.A.R. Signal Section Specification 162.

Lamp units for high signals installed on tangent track shall have clear outer doublet lens with 40 degree deflecting bullseye.

Lamp units for high signals installed on curved track shall have clear 30 degree outer doublet spreadlite lens with 40 degree flat deflecting roundel.

Marker lamp unit with clear inner doublet lens shall be provided with copper wire screen.

Ordering reference for complete signal shall consist of three characters as follows:
FIRST – Letter designating main group.
SECOND – Figure designating top marker group.
THIRD – Figure designating bottom marker group.

TYPICAL ORDERING REFERENCE

Dwarf signal:
"_____ Dwarf Color Position Light Signal assembly Fig. B-1-5", Dwg. S-185.

High signal for tangent track:
"_____ High Color Position Light Signal assembly Fig. B-1-5", Dwg. S-185.

High signal for curved track:
"_____ High Color Position Light Signal assembly with 30 degree spreadlite lens, Fig. B-1-5, Dwg. S-185.

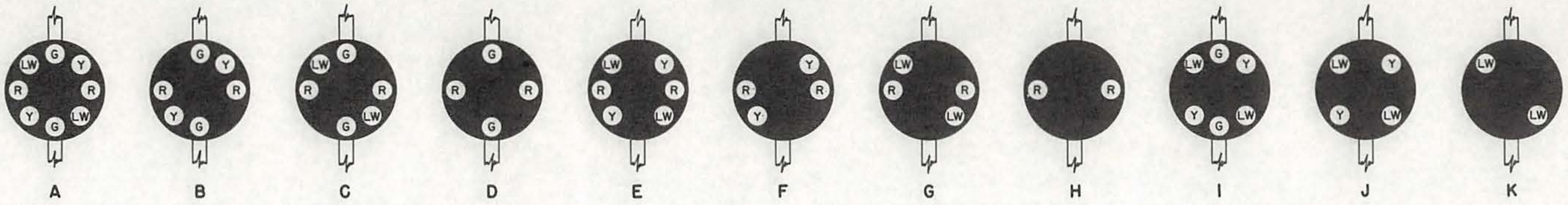
APPROVED: A S Hunt
CHIEF ENG'R. COMM. & SIGS.

BALTIMORE & OHIO RAILROAD
ASSEMBLIES OF
COLOR POSITION LIGHT SIGNALS
OFFICE OF CHIEF ENGINEER COMM. & SIGNALS
BALTIMORE, MD.
MARCH 30, 1949

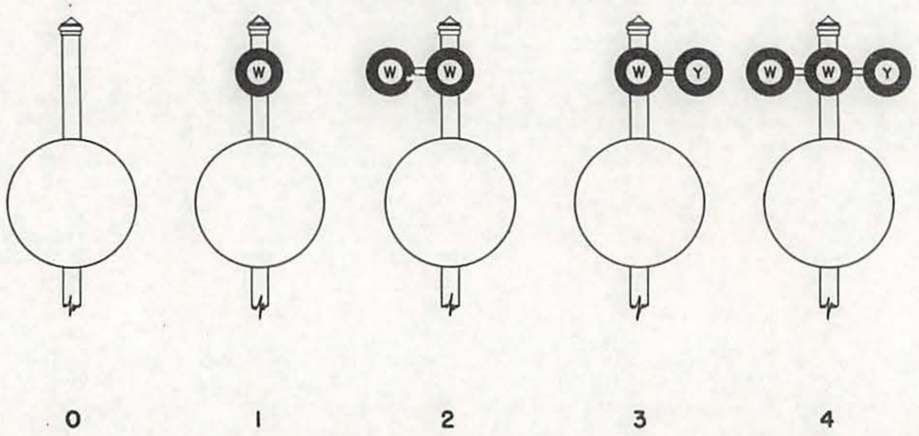
S-185

RECEIVED
OCT 14
SPECIFICATION DEPT.

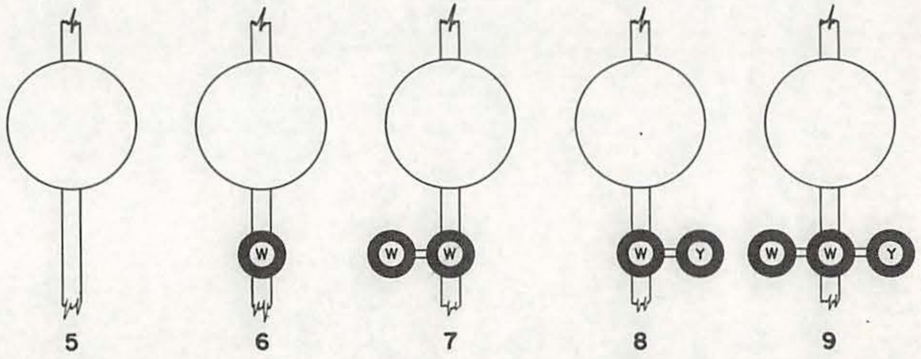
MAIN GROUP



TOP MARKER GROUP



BOTTOM MARKER GROUP



NOTES:

Signals shall conform to A.A.R. Signal Section Specification 162.

Lamp units for high signals installed on tangent track shall have clear outer doublet lens with 40 degree deflecting bullseye.

Lamp units for high signals installed on curved track shall have clear 30 degree outer doublet spreadlite lens with 40 degree flat deflecting roundel.

Marker lamp unit with clear inner doublet lens shall be provided with copper wire screen. See Dwg. S-193-D, sh.1.

Ordering reference for complete signal shall consist of three characters as follows:
FIRST – Letter designating main group.
SECOND – Figure designating top marker group.
THIRD – Figure designating bottom marker group.

TYPICAL ORDERING REFERENCE

Dwarf signal:
"_____ Dwarf Color Position Light Signal assembly Fig. B-1-5", Dwg. S-185-B.

High signal for tangent track:
"_____ High Color Position Light Signal assembly Fig. B-1-5", Dwg. S-185-B.

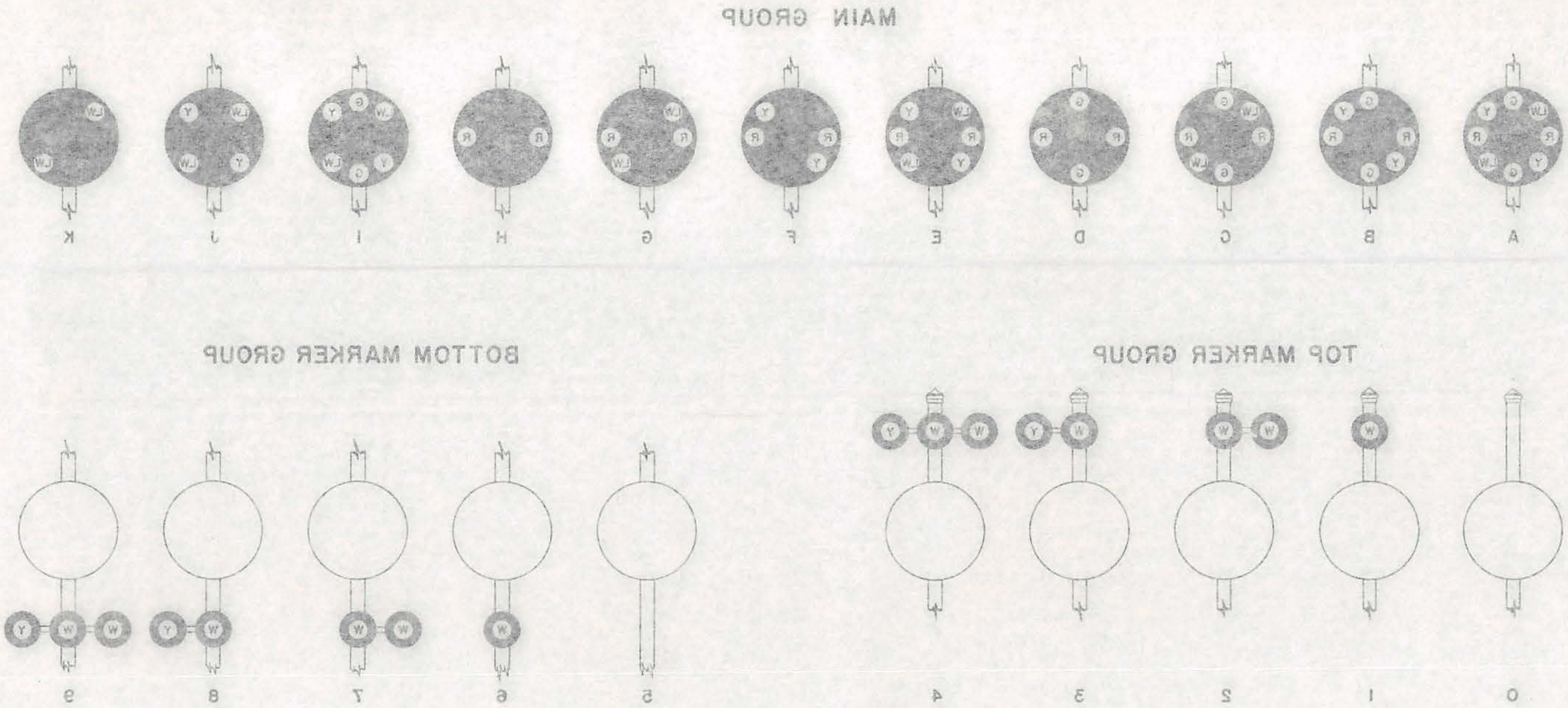
High signal for curved track:
"_____ High Color Position Light Signal assembly with 30 degree spreadlite lens, Fig. B-1-5, Dwg. S-185-B.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
ASSEMBLIES OF
COLOR POSITION LIGHT SIGNALS
Office of Signal Engineer
Baltimore, Md.
Sept. 11, 1958.

Plan dated: March 30, 1949.
Revised 9-9-53: Drawing reference for wire mesh screen added.
Revised 9-11-58.

S-185-B



NOTES:

Signals shall conform to A.A.R. Signal Section Specification 162.

Lamp units for high signals installed on tangent track shall have clear outer doublet lens with 40 degree deflecting bullseye.

Lamp units for high signals installed on curved track shall have clear 30 degree outer doublet spreadlite lens with 40 degree flat deflecting roundel.

Marker lamp unit with clear inner doublet lens shall be provided with copper wire screen. See Dwg. S-193-D, sh.1.

Ordering reference for complete signal shall consist of three characters as follows:
FIRST – Letter designating main group.
SECOND – Figure designating top marker group.
THIRD – Figure designating bottom marker group.

TYPICAL ORDERING REFERENCE

Dwarf signal:
"____ Dwarf Color Position Light Signal assembly
Fig. B-1-5", Dwg. S-185-B.

High signal for tangent track:
"____ High Color Position Light Signal assembly
Fig. B-1-5", Dwg. S-185-B.

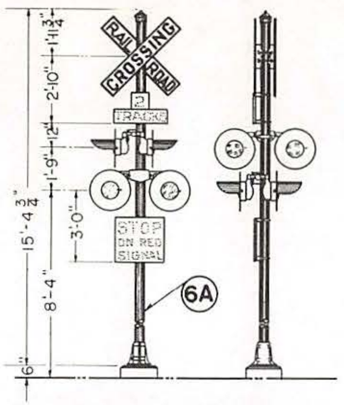
High signal for curved track:
"____ High Color Position Light Signal assembly
with 30 degree spreadlite lens, Fig. B-1-5,
Dwg. S-185-B.

Approved: A. C. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
ASSEMBLIES OF
COLOR POSITION LIGHT SIGNALS
Office of Signal Engineer
Baltimore, Md.
Sept. 11, 1958.

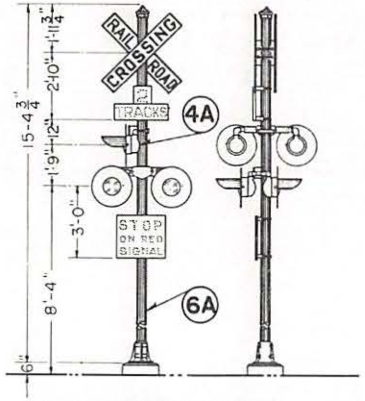
S-185-B

Plan dated: March 30, 1949.
Revised 9-9-53: Drawing reference for wire mesh screen added.
Revised 9-11-58.



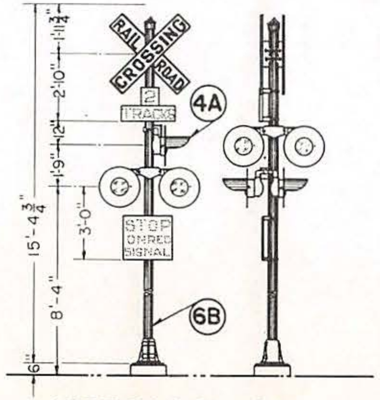
RAIL
CROSSING
ROAD
2
TRACKS
STOP ON RED SIGNAL
1'-11¾"
2'-10"
12"
1'-9"
3'-0"
15'-4¾"
8'-4"
6"
6A

ASSEMBLY NO. 1861



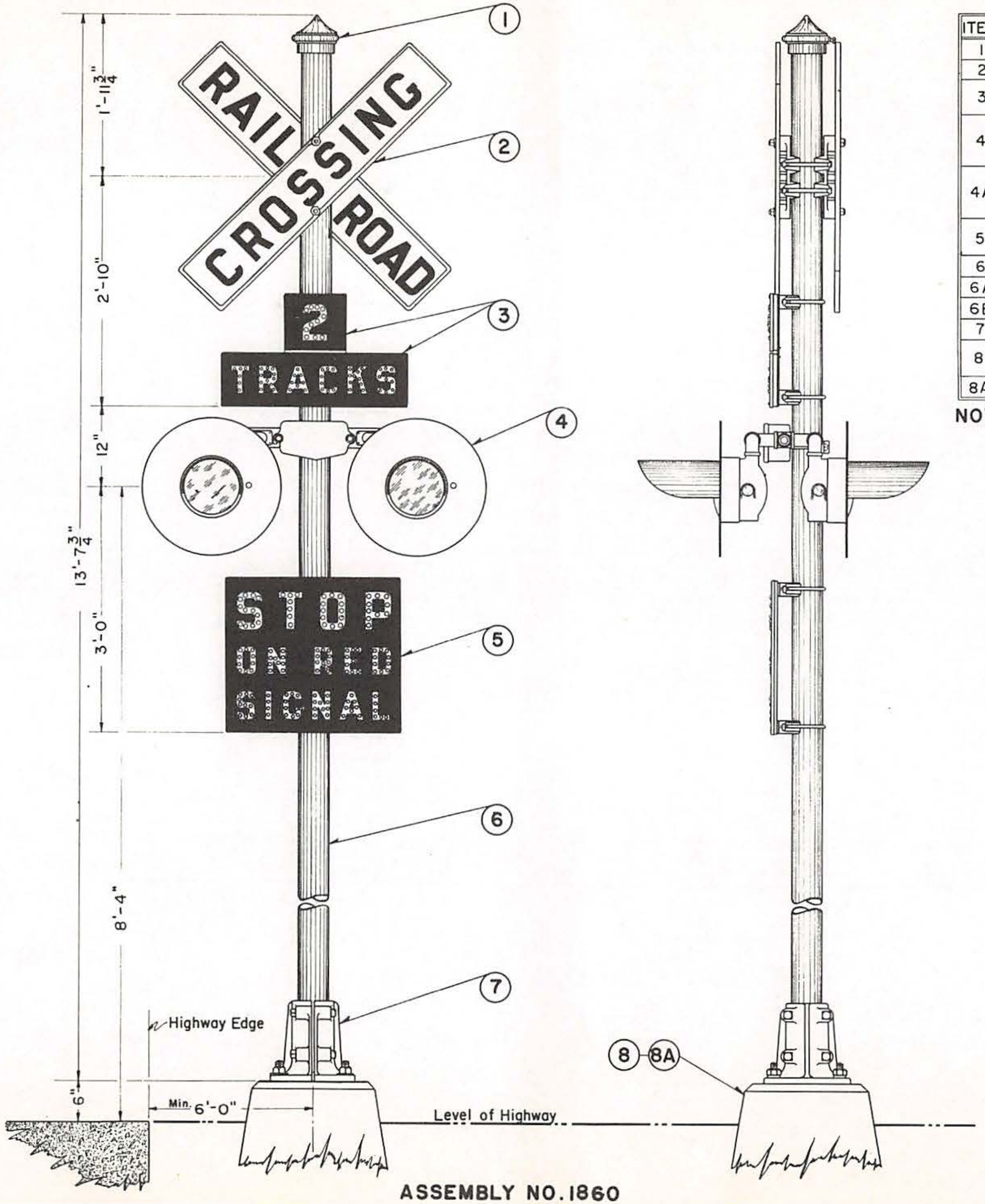
RAIL
CROSSING
ROAD
2
TRACKS
STOP ON RED SIGNAL
1'-11¾"
2'-10"
12"
1'-9"
3'-0"
15'-4¾"
8'-4"
6"
4A
6A

ASSEMBLY NO. 1862



RAIL
CROSSING
ROAD
2
TRACKS
STOP ON RED SIGNAL
1'-11¾"
2'-10"
12"
1'-9"
3'-0"
15'-4¾"
8'-4"
6"
4A
6B

ASSEMBLY NO. 1863



①
②
③
④
⑤
⑥
⑦
⑧
8A
RAIL
CROSSING
ROAD
2
TRACKS
STOP
ON RED
SIGNAL
1'-11¾"
2'-10"
12"
13'-7¾"
3'-0"
8'-4"
6"
Highway Edge
Min. 6'-0"
Level of Highway

ASSEMBLY NO. 1860

ITEM	DESCRIPTION	DRAWING
1	Short Pinnacle No.12452	S-362-B
2	90° Cast-Iron Crossing Sign complete No.16404	S-413-D
3	Reflector Multiple Track Sign complete, vitreous enamel finish, No. 164513	S-417-E
4	Flashing Light Signal Unit, for two way indication, with 30° spreadlite roundels, complete with A.A.R. junction box crossarm.	
4A	Flashing Light Signal Unit, for one way indication, with 30° spreadlite roundels, complete with A.A.R. junction box crossarm.	
5	Reflector Stop On Red Signal Sign complete, vitreous enamel finish, No. 16468	S-418-E
6	Flashing Light ~~Signal~~ Mast No. 18601.	S-186-D,sh2
6A	" " " " No. 18602.	S-186-D,sh.2
6B	" " " " No. 18603.	S-186-D,sh.2
7	Base for 4" mast, No.14492.	S-394
8	Foundation for use with AAR Base No. 14492 (For Flashing Light Signals) No. 12417.	S-124-D,sh.6
8A	Foundation for Flashing Light Signal No. 1247.	S-124-D,sh3

NOTES:

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Track Signs are not required for one track. Where there are two or more tracks specify numeral required.

When reflector crossing signs are required they shall conform to No. 16429, Dwg. S-416-F.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Painting shall be in accordance with current instructions I-134.

Light units shall conform to current A.A.R. Specification 190—

When ordering mast separately specify Assembly Number.

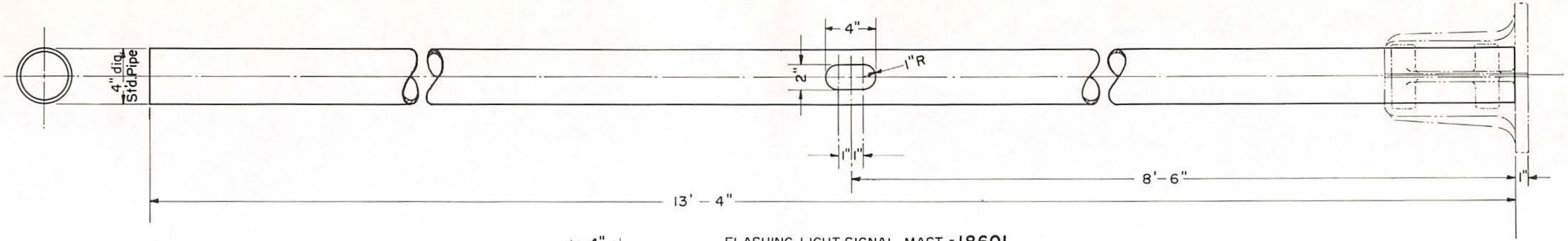
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
FLASHING LIGHT
HIGHWAY CROSSING SIGNAL
Office of Signal Engineer
Baltimore, Md.
May 22, 1959

Sheet No. 1

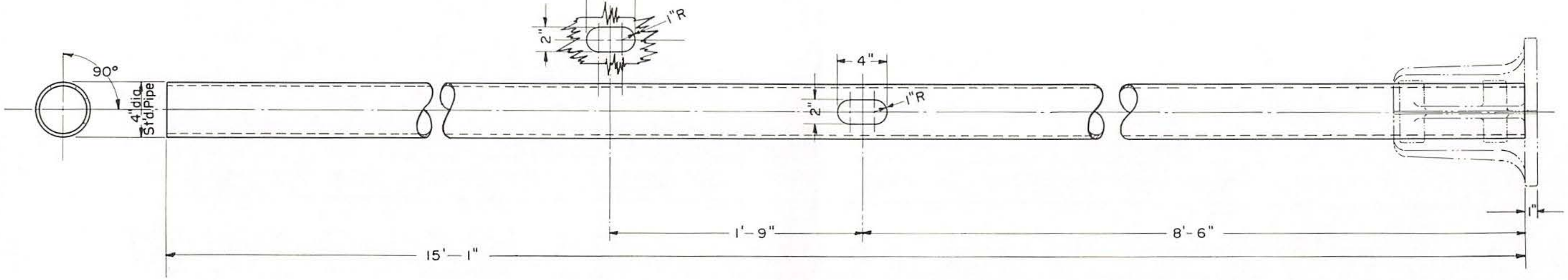
S-186-D

6-15-49: New plan made
4-25-50: Adopted.
11-18-52: 6" added to overall length of m
1-14-53: Length of Items 6 & 6A changed.
7-10-55: Masts detailed.
5-22-59: Detail plan numbers brought up to date.



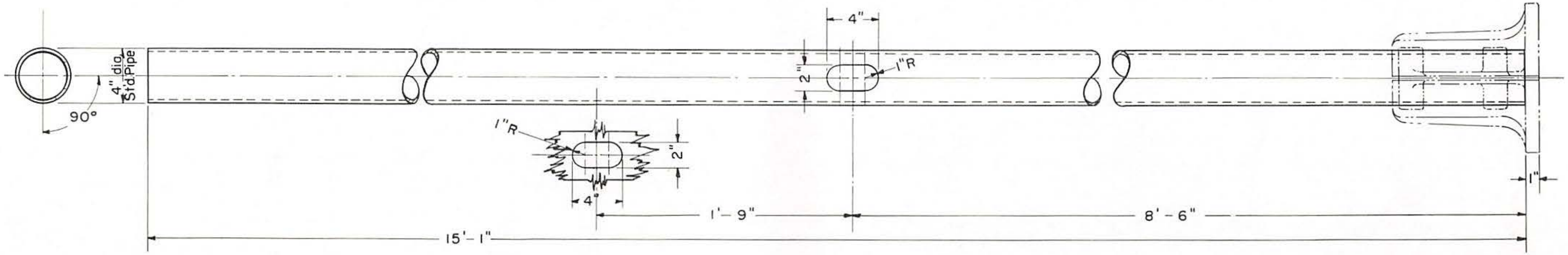
4" dia. Std. Pipe
4"
2"
1"R
1" 1"
8'-6"
1"
13'-4"

FLASHING LIGHT SIGNAL MAST - **18601**



4"
2"
1"R
90°
4" dia. Std. Pipe
4"
2"
1"R
1"
1'-9"
8'-6"
15'-1"

FLASHING LIGHT SIGNAL MAST - **18602**



4"
2"
1"R
4" dia. Std. Pipe
90°
1"R
2"
4"
1"
1'-9"
8'-6"
15'-1"

FLASHING LIGHT SIGNAL MAST - **18603**

BALTIMORE & OHIO RAILROAD

MAST DRILLING FOR FLASHING LIGHT HIGHWAY CROSSING SIGNAL

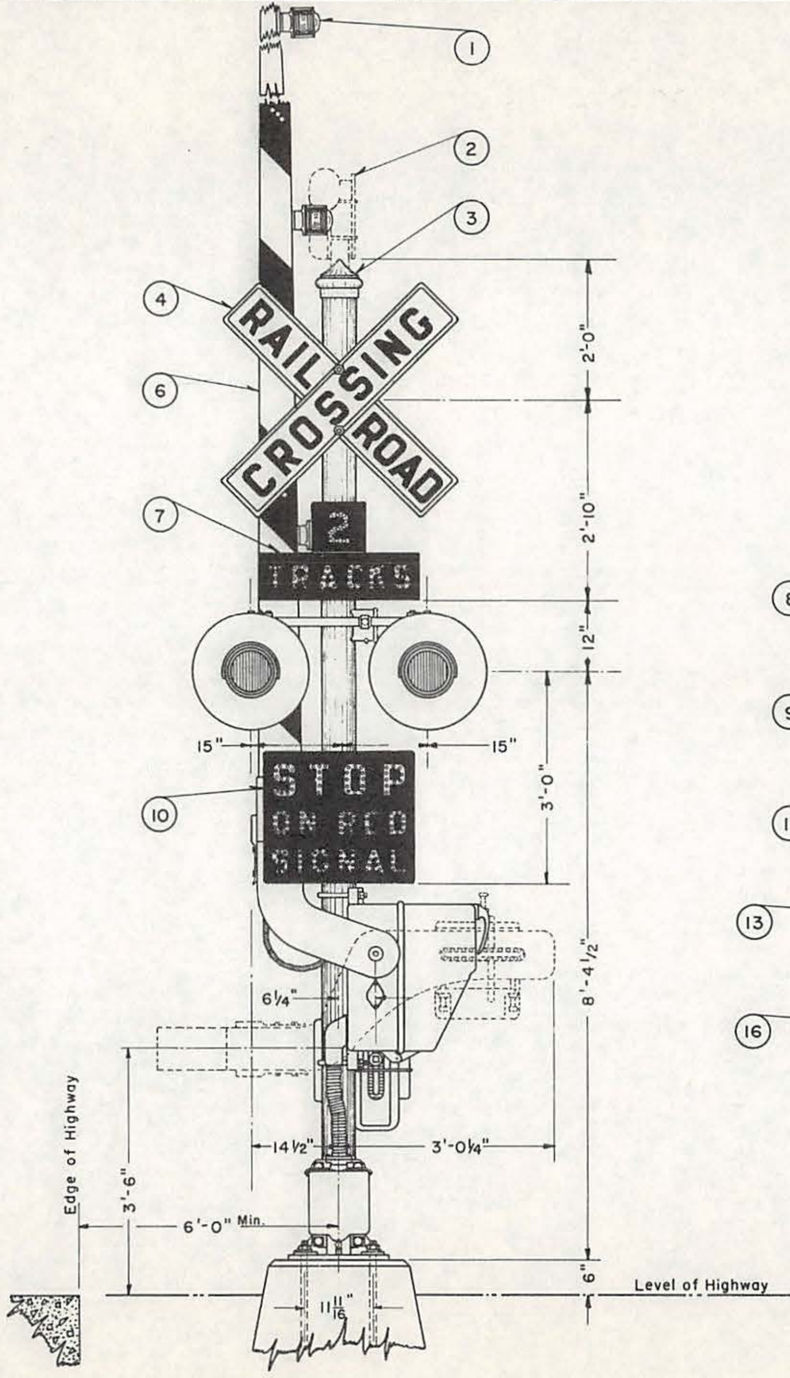
Office of Signal Engineer
Baltimore, Md.
May 22, 1959

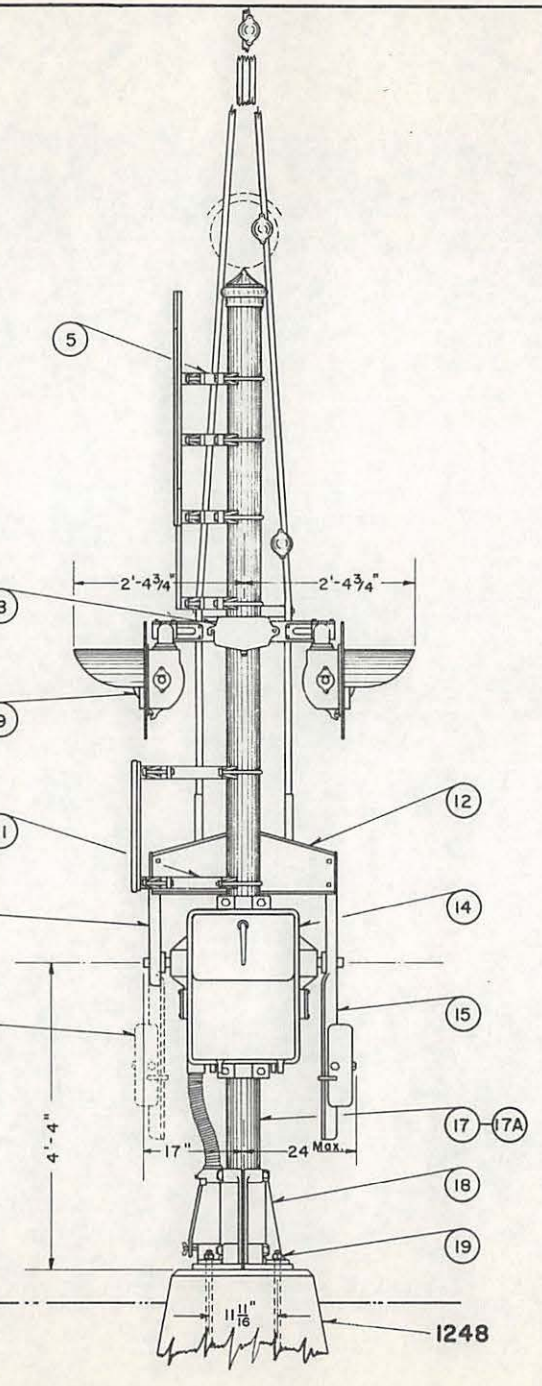
Approved: A. L. Jordan
Signal Engineer

Sheet No. 2

S-186-D

6-20-56: New plan made.
5-22-59: Revised.





ITEM	DESCRIPTION		DRAWING
1	No. 71615X Transport Products Gate Lamp	T.P.C.	E3
2	12 Volt D.C. Crossing Bell for 5" Pipe	WRRS	222FR
3	Short Pinnacle No.12451		S-362-B
4	90° Cast-Iron Crossing Sign No.16404		S-413-D
5	Extension Bracket for Items 4 and 7	WRRS	3366-40
6	Gate Arm complete less Lamps	WRRS	3565-34L
7	Reflector Multiple Track Sign assembly, Vitreous Enamel finish No.16458.		S-417-E
8	Junction Box Lamp Arm assembly.	WRRS	950-54
9	Flashing Light Signal Unit	WRRS	950-201
10	Reflector Stop on Red Signal Sign assembly, Vitreous Enamel finish No. 16463.		S-418-E
11	Extension Bracket for item 10	WRRS	3366-140
12	Gate Arm Support	WRRS	3565-105
13	Gate Support Arm	WRRS	3565-101
14	Crossing Gate Mechanism, 12 Volt D.C., 90° operation, power down, roadway arm only.	WRRS	3566-121C90
15	R.H. Gate and Counterweight assembly	WRRS	3565-103R
16	L.H. Gate and Counterweight assembly	WRRS	3565-102L
17	5"x13'-10" pipe mast		
17A	5"x15'-7" pipe mast (Use only when Type 855-20 Lamp arm is required.)		
18	Junction Box Clamp Type Base	WRRS	2149-11
19	1"x36" Galvanized anchor bolts complete with hex. nut and flat washer A.A.R. 11079.		S-311

NOTES:

During and after erection of gates care must be exercised to see that gate arm safely clears all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Where there are two or more tracks specify numeral required. (Track signs are not required in the State of Illinois.)

When reflector crossing signs are required they shall conform to No. 16429 Dwg. S-416-F.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Gate lamps shall conform to current A.A.R. specification 236 except method of mounting.

Lamps shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lamps from the view of an approaching traveler.

Lamp units shall conform to current A.A.R. specification 190–

Order must specify length of gate arm required.

Gate arms shall be painted in accordance with Dwg. S-402-E residue of painting in accordance with Instructions I-134-C.

Item 16, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

BALTIMORE & OHIO RAILROAD

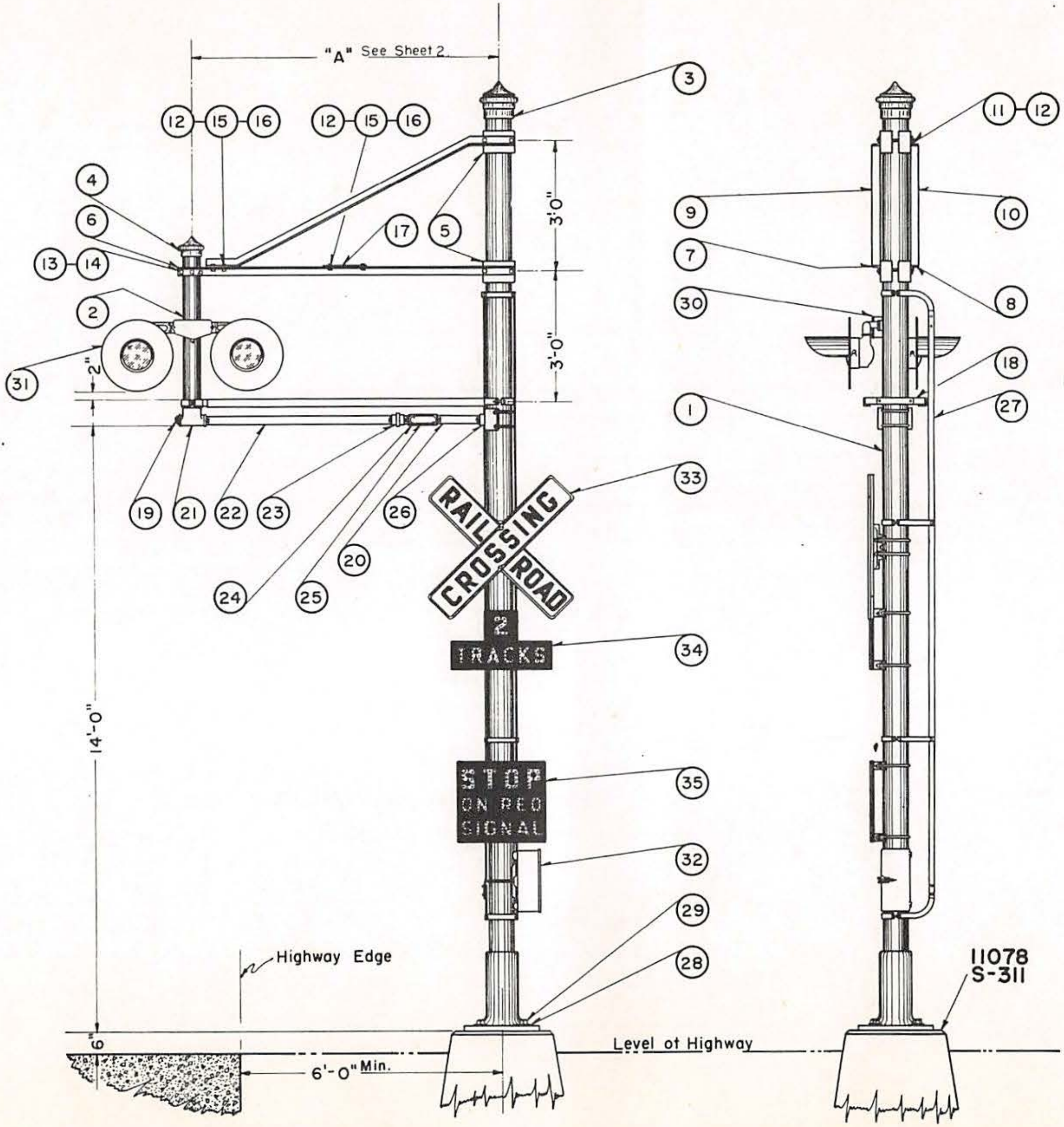
FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH AUTOMATIC SHORT ARM GATE

Office of Signal Engineer
Baltimore, Md.
May 6, 1958

Approved: A. L. Jordan
Signal Engineer

S-187-B

Made & Corrected 6-21-49.
Adopted: 4-28-50.
Revised 5-6-58 Item 1 changed from W.R.R.S. gate lamp 1585 to T.P.C. gate lamp 71615 X.


"A" See Sheet 2.
(3)
(12)-(15)-(16)
(12)-(15)-(16)
(4)
(6)
(13)-(14)
(17)
(5)
3'-0"
3'-0"
(2)
(31)
2"
(19) (21) (22) (23)
(26)
(20)
(24) (25)
RAIL ROAD
CROSSING
2
TRACKS
(33)
(34)
STOP ON RED SIGNAL
(35)
(32)
(29)
(28)
14'-0"
Highway Edge
6"
6'-0" Min.
Level of Highway
(11)-(12)
(9)
(10)
(7)
(8)
(30)
(18)
(27)
(1)
11078
S-311

NOTES:

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Track Signs are not required for one track. Where there are two or more tracks specify numeral required.

Order must specify whether 6'-0" or 8'-0" offset is required.

For attaching 2 one-way signal units back to back at right angle to 6" I.D. pipe mast use 2 Transport Products Corp. short cross-arm adapters Dwg. 70511.

When reflector crossing signs are required they shall conform to No. 16429, Dwg. S-416-F.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Light units shall conform to current A.A.R. Specification 190

Painting shall be in accordance with current Instructions I-134.

Approved: A.L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH 6'-0" or 8'-0" OFFSET

Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

10-18-49: New Plan Made.
4-25-50: Adopted.
3-13-59: Revised.

Sheet No. 1

S-188-A

MATERIAL LIST FOR CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL			A = 6'-0" 45906-192Gr.3	A = 8'-0" 45906-192Gr.4
ITEM	NAME	G.R.S. NO.	REQ'D.	REQ'D.
1	6"dia. Extra Strong Pipe Mast and Base	48848-26Gr.2	1	1
2	4"dia. Pipe	11560-12	1	1
3	Pinnacle, 6"dia. Pipe	56894 Gr.4	1	1
4	Pinnacle, 4"dia. Pipe	43957-2	1	1
5	Block, 6"dia. Pipe	4354-2	4	4
6	Adapter	35378-12	2	2
7	Angle	see req'd. column	54310-826	54310-831
8	Angle	see req'd. column	54310-827	54310-832
9	Angle	see req'd. column	54310-828	54310-833
10	Angle	see req'd. column	54310-829	54310-834
11	5/8"-11 X 10" Machine Bolt with Hex. Nut	41927-3	4	4
12	5/8" X 1/8"th. Spring Washer	0113-2	12	12
13	1/2"-13 X 10" Machine Bolt with Hex. Nut	0592-6	3	3
14	1/2"dia. Spring Washer	091-7	3	3
15	5/8"- 11 X 1 1/2" Machine Bolt	2891-1	8	8
16	5/8"- 11 X 9/16"th. C.P. Nut	645-6	8	8
17	Plate	41885-55	1	1
18	Platform	see req'd. column	313-66Gr.1	313-66Gr.2
19	2"Pipe Plug	43349	1	1
20	2"Galv. Steel Pipe	21490-15	1	1
21	Tee 2"X2"X4"Galv.	0699-12	1	1
22	2"Galv. Steel Pipe	see req'd. column	21490-18	21490-19
23	2"Galv. Union	47919-14	1	1
24	2"Condulet	51917-7	1	1
25	Cover and Gasket	56648	1	1
26	Clamp, 6"(Saddle)	4137-18	1	1
27	Ladder, Complete	307-6 Gr.10	1	1
28	Plate Washer, 1 1/16"X 2 1/2"X 11/64"th.	074	4	4
29	Anchor Bolt, 1"-8 X 36"	22172 Gr.4	4	4
30	Arm Complete	48870-12 Gr.2	1	1
31	Signal Unit, two way indication, with 30° spreadlite & 15° downward deflecting roundels	55050-3Gr.16	4	4
32	Junction Box	43920-6 Gr.5	1	1
33	90° Cast-Iron Crossing Sign, A A R. 16401, complete with "U" bolts and adapter as shown.	55256-29Gr.1	1	1
34	Reflector Multiple Track Sign complete, vitreous enamel finish	55256-13	1	1
35	Reflector Stop On Red Signal Sign complete, vitreous enamel finish	55256-14 Gr.1	1	1

Approved A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

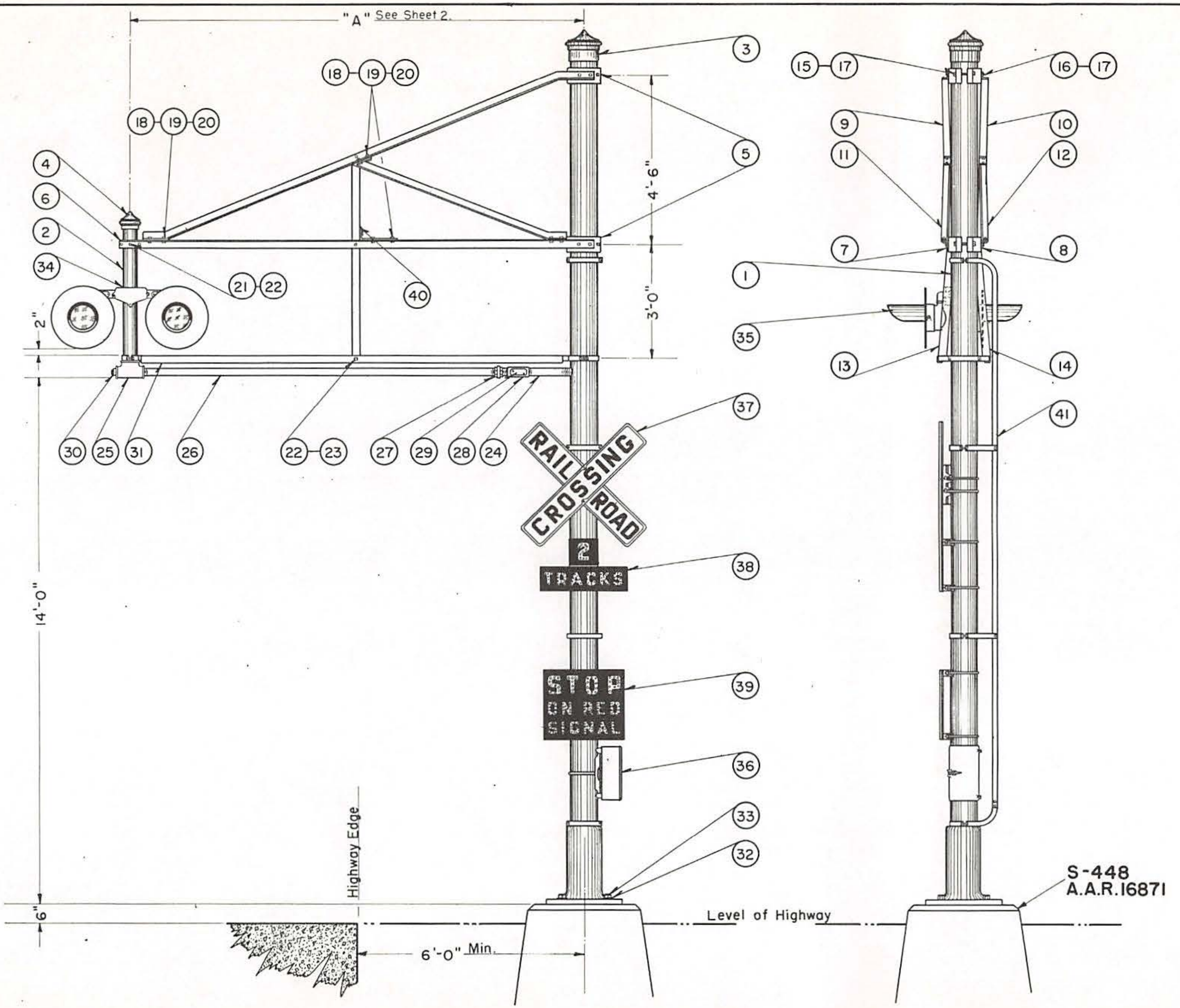
MATERIAL LIST FOR CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH 6'-0" or 8'-0" OFFSET

Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

10-18-49: New Plan Made.
4-25-50: Adopted.
3-13-59: Revised.

Sheet No. 2

S-188-A


"A" See Sheet 2.
③
⑱-⑲-⑳
⑱-⑲-⑳
④
⑥
②
㉞
㉑ ㉒
㊵
⑤
4'-6"
3'-0"
2"
30 25 31
26
22-23
27 29 28 24
37
RAIL ROAD CROSSING
2
TRACKS
38
STOP ON RED SIGNAL
39
36
33
32
14'-0"
6"
Highway Edge
6'-0" Min.
Level of Highway
15-17
16-17
⑨
⑩
⑪
⑫
⑦
⑧
①
35
⑬
⑭
41
S-448
A.A.R.16871

NOTES:

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Track Signs are not required for one track. Where there are two or more tracks specify numeral required.

Order must specify whether 10'-0" or 12'-0" offset is required.

For attaching 2 one way signal units back to back at right angles to 6" I.D. pipe mast use 2 Transport Products Corp. short cross arm adapters Dwg. 70511.

When reflector crossing signs are required they shall conform to No. 16429, Dwg. S-416-F.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Light units shall conform to current A.A.R. Specification 190.

Painting shall be in accordance with Current Instructions I-134.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH 10'-0" or 12'-0" OFFSET

Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

9-20-49: New Plan Made.
4-25-50: Adopted.
3-13-59: Revised.

Sheet No. 1

S-189-B

MATERIAL LIST FOR CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL			A = 10'-0" 45906-187 Gr.3	A = 12'-0" 45906-187 Gr.4
ITEM	NAME	G.R.S. NO.	REQ'D.	REQ'D.
1	8"dia. Extra Strong Pipe Mast and Base	48848-29 Gr.1	1	1
2	4"dia. Pipe	11560-12	1	1
3	Pinnacle, 8"dia. Pipe	56894 Gr.7	1	1
4	Pinnacle, 4"dia. Pipe	43957-2	1	1
5	Block, 8"dia. Pipe	4354-5	4	4
6	Adapter	35378-12	2	2
7	Angle	See Req'd. Column	^{1}54310-892	^{1}54310-894
8	Angle	See Req'd. Column	^{1}54310-893	^{1}54310-895
9	Angle	See Req'd. Column	^{1}54310-896	^{1}54310-898
10	Angle	See Req'd. Column	^{1}54310-897	^{1}54310-899
11	Angle	See Req'd. Column	^{1}54310-900	^{1}54310-902
12	Angle	See Req'd. Column	^{1}54310-901	^{1}54310-903
13	Angle	See Req'd. Column	^{1}54310-904	^{1}54310-906
14	Angle	See Req'd. Column	^{1}54310-905	^{1}54310-907
15	3/4"-10 X 8 1/2" Machine Bolt with Hex. Nut	32446-16	4	4
16	3/4"-10 X 1 1/2" Machine Bolt with Hex. Nut	6013-7	8	8
17	3/4" Spring Washer	029-5	12	12
18	5/8"-11 X 1 1/2" Machine Bolt	2891-1	22	22
19	5/8" X 1/8" Spring Washer	0113-2	22	22
20	5/8"-11 X 9/16"th. C.P. Nut.	645-6	22	22
21	1/2"-13 X 10" Machine Bolt with Hex. Nut	0592-6	3	3
22	1/2" Spring Washer	091-7	5	5
23	1/2"-13 X 1 3/4" Hex. Hd. Machine Bolt with Hex. Nut	16578-1	2	2
24	2" Galv. Steel Pipe	21490-15	1	1
25	Tee 2"x2"x4" Galv.	0699-12	1	1
26	2"dia. Galv. Steel Pipe	See Req'd Column	^{1}21490-20	^{1}21490-21
27	2" Galv. Union	47919-14	1	1
28	2" Condulet	51917-7	1	1
29	Cover and Gasket	56648	1	1
30	2" Pipe Plug	43349	1	1
31	Platform	See Req'd. Column	^{1}313-70 Gr.1	^{1}313-70 Gr.2
32	Plate Washer	0381-1	4	4
33	Anchor Bolt 1 1/4"-7 X 42"	22349-1 Gr.1	4	4
34	Arm Complete	48870-12 Gr.2	1	1
35	Signal Unit, two way indication, with 30° spreadlite & 15° downward deflecting roundels	55050-3 Gr.16	4	4
36	Junction Box	43920-6 Gr.6	1	1
37	90° Cast-Iron Crossing Sign, A.A.R. 16401, complete with "U" bolts and adapter as shown	55256-29 Gr.1	1	1
38	Reflector Multiple Track Sign complete, vitreous enamel finish (Specify number of tracks)	55256-13	1	1
39	Reflector Stop On Red Signal Sign complete, vitreous enamel finish.	55256-14 Gr.1	1	1
40	Plate	41885-78	1	1
41	Ladder, Complete	307-6 Gr.11	1	1

9-20-49: New Plan Made.
4-25-50: Adopted.
3-13-59: Revised.

Approved: A L Jordan
Signal Engineer

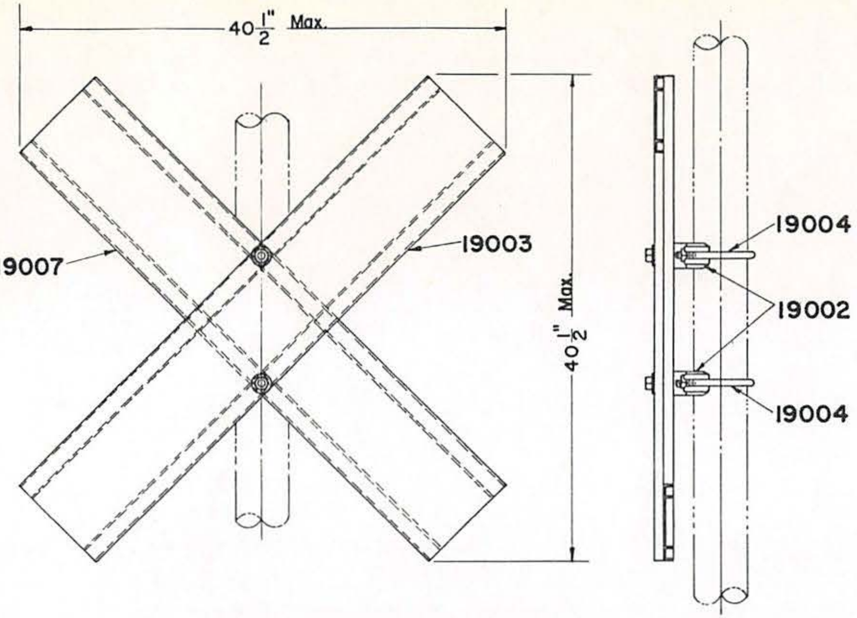
BALTIMORE & OHIO RAILROAD

MATERIAL LIST FOR CANTILEVER TYPE FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH 10'-0" or 12'-0" OFFSET

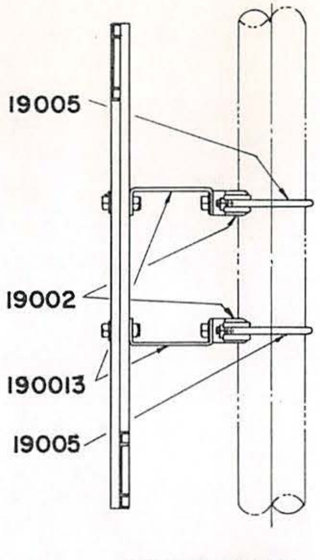
Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

Sheet No. 2

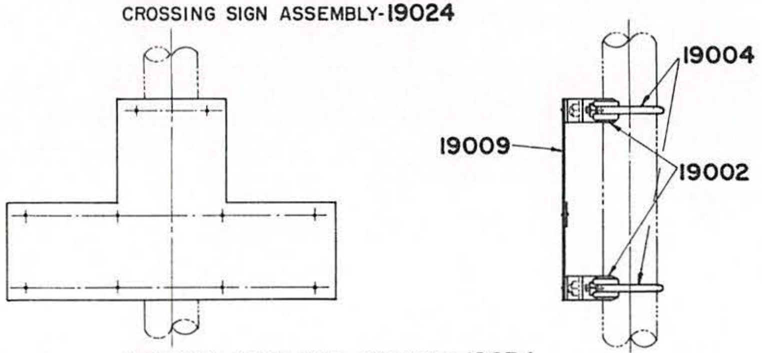
S-189-B



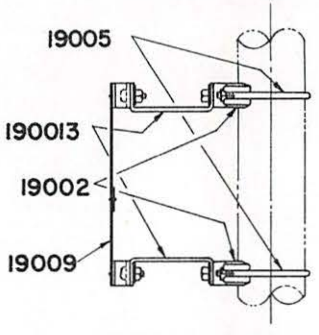
CROSSING SIGN ASSEMBLY-19024



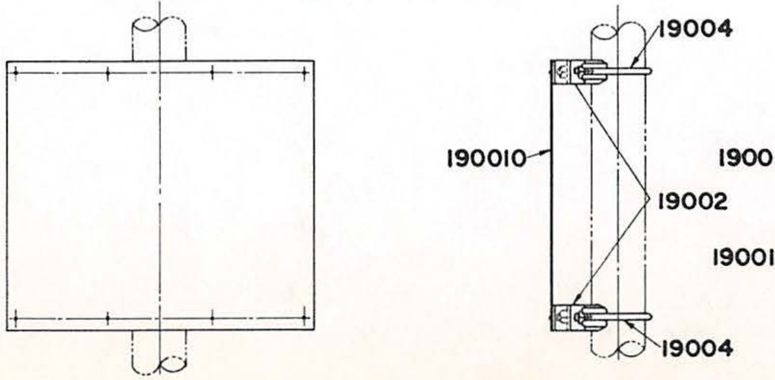
ASSEMBLY-19025



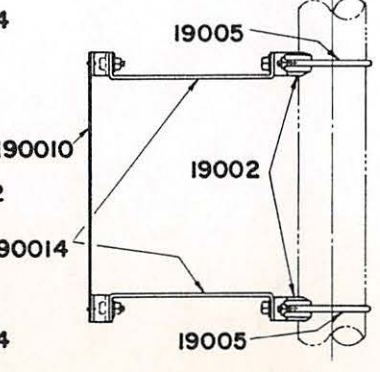
MULTIPLE TRACK SIGN ASSEMBLY-19034



ASSEMBLY-19035



STOP ON RED SIGNAL SIGN ASSEMBLY-19044



ASSEMBLY-19045

	No.19003-Reflectorized Crossing Plate.	No.19007-Reflectorized Railroad Plate	No.19009-Reflectorized Multiple Track Sign.	No.190010-Reflectorized "Stop On Red Signal" Sign.				No.19002-Aluminum Adapter Clamp T.P.C. No.80456-A	No.190013-Short Extension Arm.	No.190014-Long Extension Arm.	No.19004-"U" Bolt for 4" dia. pipe T.P.C. No.80457X	No.19005"U"-Bolt for 5" dia. pipe	No.19006-"U" Bolt for 6" dia. pipe	No.19008-"U"Bolt for 8" dia. pipe	5/8"-11 x 1-1/4" Sq. Hd. Aluminum Machine Bolt with Hex. Nut	5/8"-11 x 2" Sq. Hd. Aluminum Machine Bolt with Hex. Nut	5/8"-11 x 2-1/2" Sq. Hd. Aluminum Machine Bolt with Hex. Nut	5/8"-11x 3-1/4" Sq. Hd. Aluminum Machine Bolt with Hex. Nut	5/8" Galv. Flat Washer	
For Flashing Light Signal																				
90° REFLECTORIZED RAILROAD CROSSING SIGN ASSEMBLY NO. 19024	1	1						2			2							2	2	
REFLECTORIZED MULTIPLE TRACK SIGN ASSEMBLY NO. 19034			1					2			2					2			2	
REFLECTORIZED "STOP ON RED SIGNAL" SIGN ASSEMBLY NO. 19044				1				2			2					2			2	
For Automatic Gate and Flashing Light Signal																				
90° REFLECTORIZED RAILROAD CROSSING SIGN ASSEMBLY NO. 19025	1	1						2	2			2				2	2		4	
REFLECTORIZED MULTIPLE TRACK SIGN ASSEMBLY NO. 19035			1					2	2			2			2	2			4	
REFLECTORIZED "STOP ON RED SIGNAL" SIGN ASSEMBLY NO. 19045				1				2		2		2			2	2			4	
For 6'-0" to 8'-0" Cantilever Flashing Light Signal																				
90° REFLECTORIZED RAILROAD CROSSING SIGN ASSEMBLY NO. 19026	1	1						2					2					2	2	
REFLECTORIZED MULTIPLE TRACK SIGN ASSEMBLY NO. 19036			1					2					2			2			2	
REFLECTORIZED "STOP ON RED SIGNAL" SIGN ASSEMBLY NO. 19046				1				2					2			2			2	
For 10'-0" to 12'-0" Cantilever Flashing Light Signal																				
90° REFLECTORIZED RAILROAD CROSSING SIGN ASSEMBLY NO. 19028	1	1						2						2				2	2	
REFLECTORIZED MULTIPLE TRACK SIGN ASSEMBLY NO. 19038			1					2						2		2			2	
REFLECTORIZED "STOP ON RED SIGNAL" SIGN ASSEMBLY NO. 19048				1				2						2		2			2	

Approved: A L Jordan
Signal Engineer

Note:

Aluminum – K150-D

BALTIMORE & OHIO RAILROAD

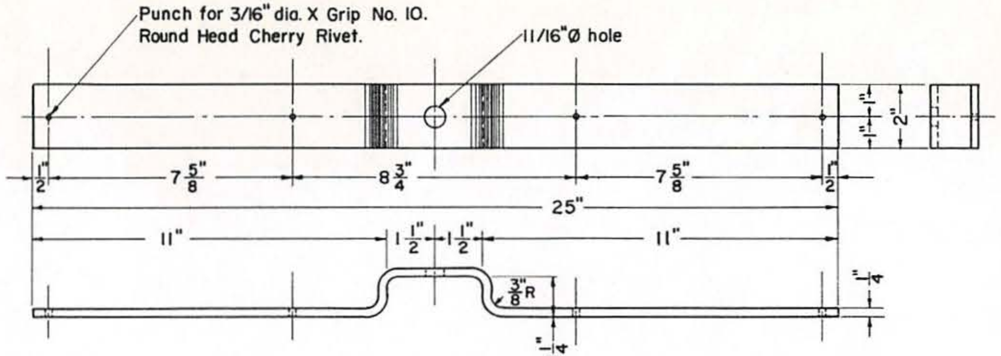
REFLECTORIZED SIGNS & FITTINGS FOR HIGHWAY CROSSING SIGNALS

Office of Signal Engineer
Baltimore, Md.
Feb. 14, 1962

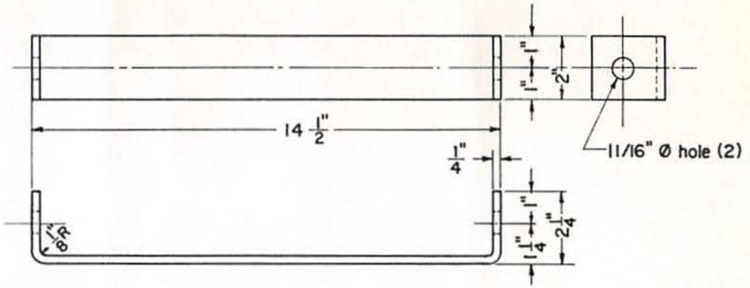
R.I.-W.J.G.

Sheet No. 1

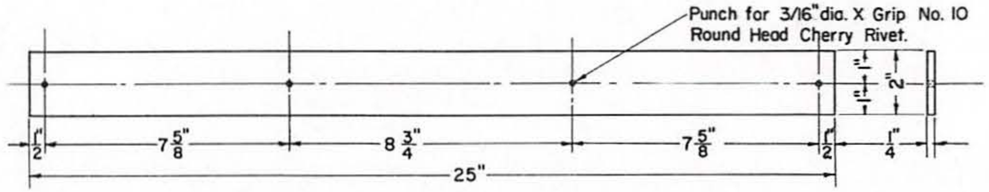
S-190-C


Punch for 3/16" dia. X Grip No. 10. Round Head Cherry Rivet.
11/16"Ø hole
1/2"
7 5/8"
8 3/4"
7 5/8"
1/2"
25"
11"
1 1/2"
1 1/2"
11"
3/8"R
1/4"
1/4"
1"
1"
2"

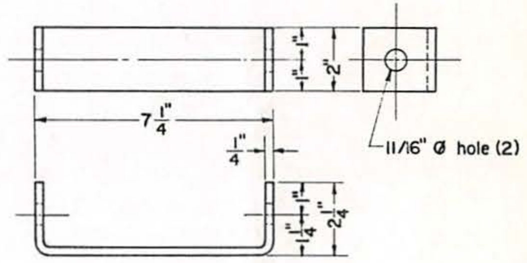
STRAP-190011


14 1/2"
1/4"
1"
1"
2"
11/16" Ø hole (2)
1/8"R
1"
1 1/4"
2 1/4"

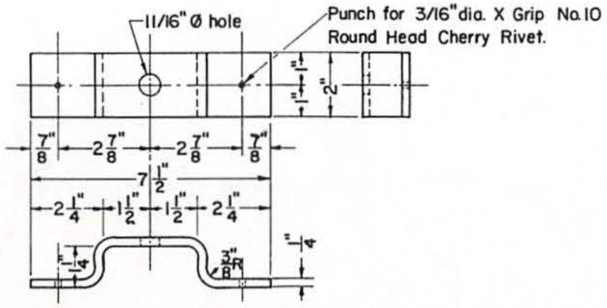
LONG EXTENSION ARM-190014


Punch for 3/16"dia. X Grip No. 10 Round Head Cherry Rivet.
1/2"
7 5/8"
8 3/4"
7 5/8"
1/2"
25"
1"
1"
2"
1/4"

STRAP-190015


1"
1"
2"
7 1/4"
1/4"
11/16" Ø hole (2)
1"
1 1/4"
2 1/4"

SHORT EXTENSION ARM-190013


11/16"Ø hole
Punch for 3/16"dia. X Grip No.10 Round Head Cherry Rivet.
1"
1"
2"
7/8"
2 7/8"
2 7/8"
7/8"
7 1/2"
2 1/4"
1 1/2"
1 1/2"
2 1/4"
1/4"
3/8"R
1/4"

STRAP-190012

Approved: A L Jordan
Signal Engineer

Note:

Aluminum-K150-D

BALTIMORE & OHIO RAILROAD

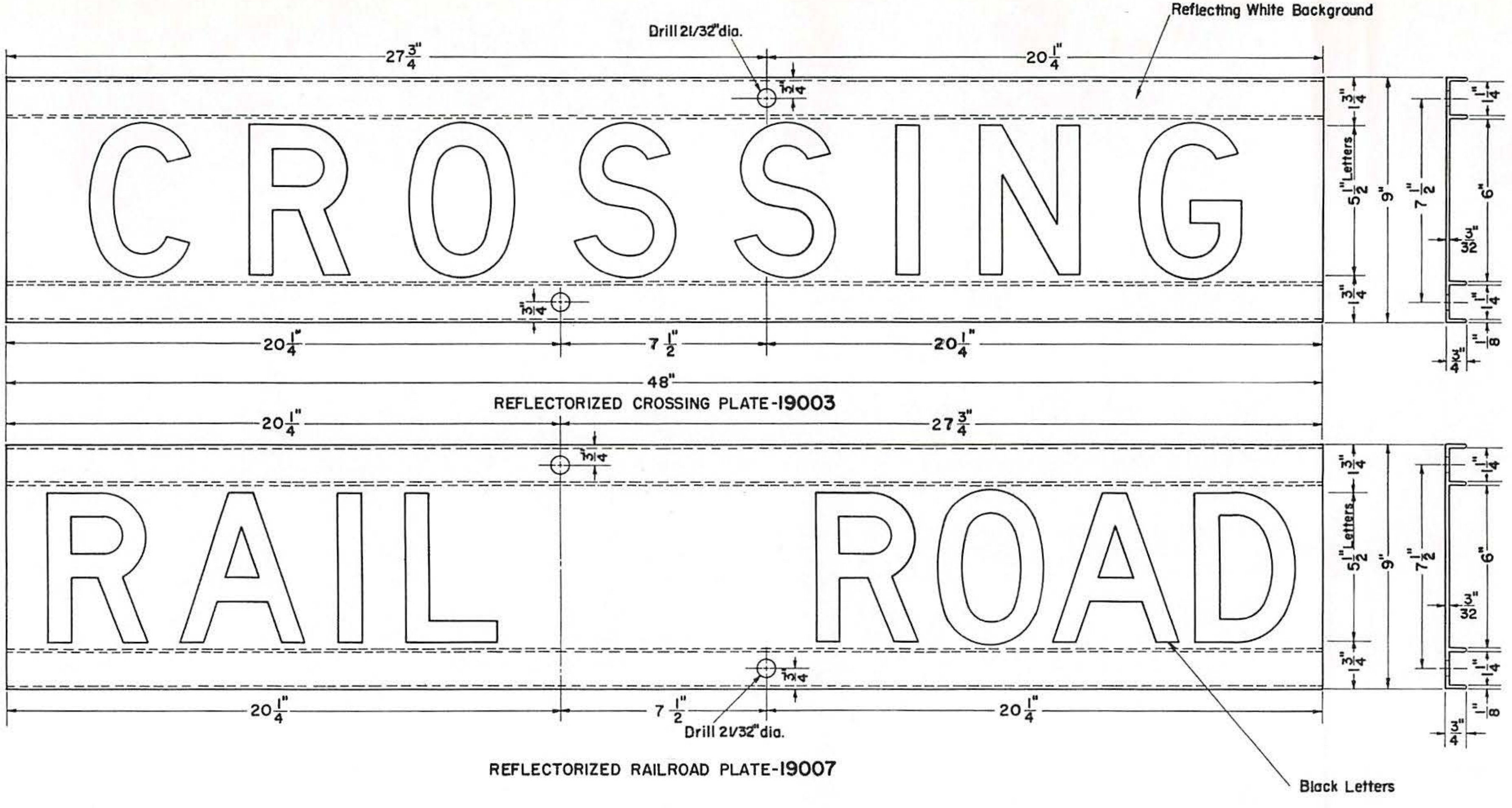
REFLECTORIZED SIGNS & FITTINGS FOR HIGHWAY CROSSING SIGNALS

Office of Signal Engineer
Baltimore, Md.
Feb.14, 1962

R.I.-W.J.G.

Sheet No. 2

S-190-C


Reflecting White Background
Drill 21/32" dia.
27 3/4"
20 1/4"
3/4"
CROSSING
5 1/2" Letters
1 3/4"
9"
7 1/2"
6"
1 1/4"
3/32"
1/8"
3/4"
20 1/4"
7 1/2"
20 1/4"
48"
20 1/4"
27 3/4"
RAIL ROAD
Drill 21/32" dia.
Black Letters

REFLECTORIZED CROSSING PLATE-19003

REFLECTORIZED RAILROAD PLATE-19007

Approved: A L Jordan
Signal Engineer

Note:

Extruded Aluminum K150-D

BALTIMORE & OHIO RAILROAD

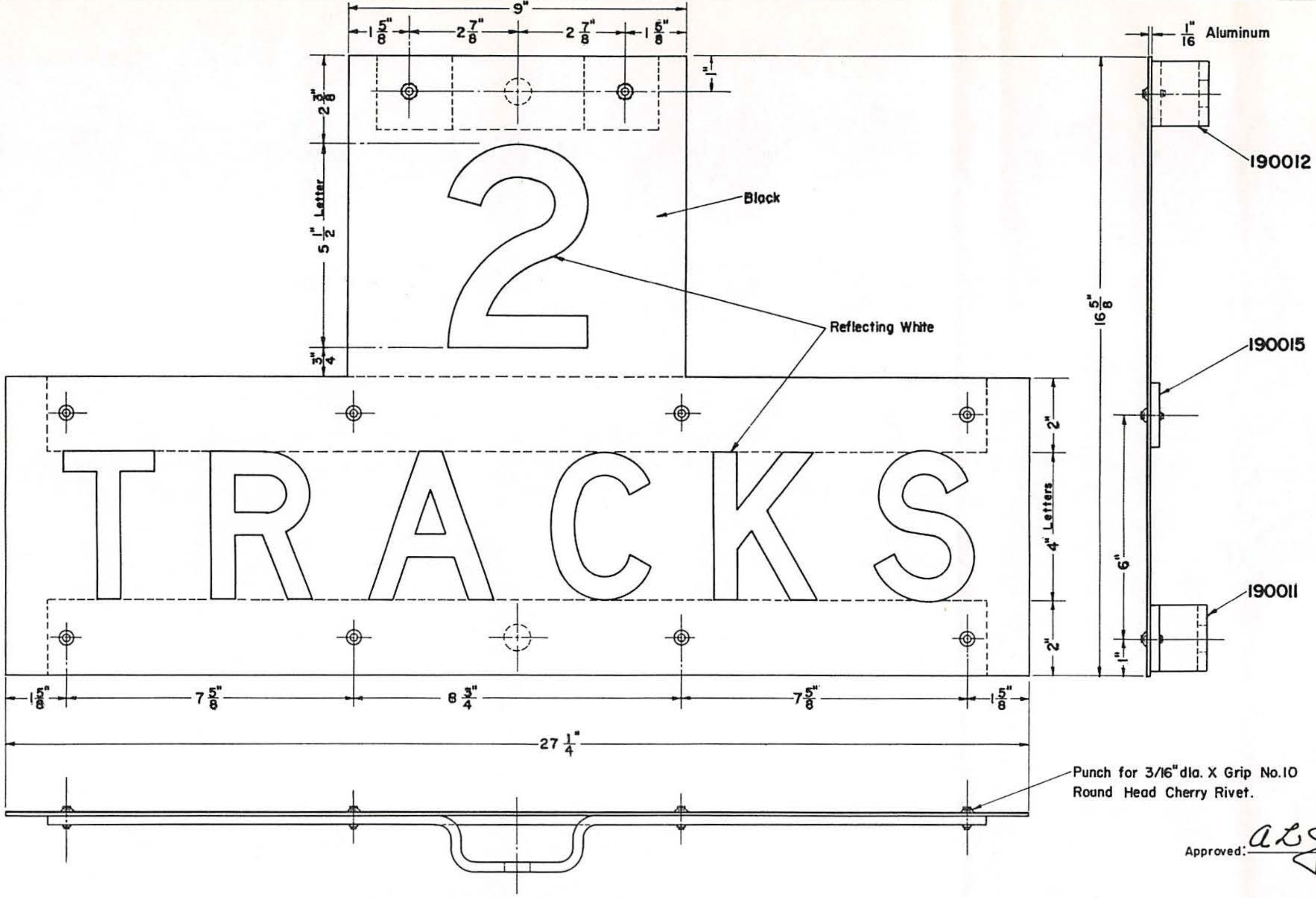
REFLECTORIZED SIGNS & FITTINGS FOR HIGHWAY CROSSING SIGNALS

Office of Signal Engineer
Baltimore, Md.
Feb.14, 1962

W.J.G.

Sheet No. 3

S-190-C


9"
1 5/8"
2 7/8"
2 7/8"
1 5/8"
1"
2 3/8"
5 1/2" Letter
3/4"
2
Black
Reflecting White
TRACKS
2"
4" Letters
2"
1 5/8"
7 5/8"
8 3/4"
7 5/8"
1 5/8"
27 1/4"
1/16" Aluminum
190012
16 5/8"
190015
6"
190011
1"

Punch for 3/16" dia. X Grip No. 10 Round Head Cherry Rivet.

Approved: A L Jordan
Signal Engineer

REFLECTORIZED MULTIPLE TRACK SIGN-19009

Note:
Aluminum K150-D

BALTIMORE & OHIO RAILROAD

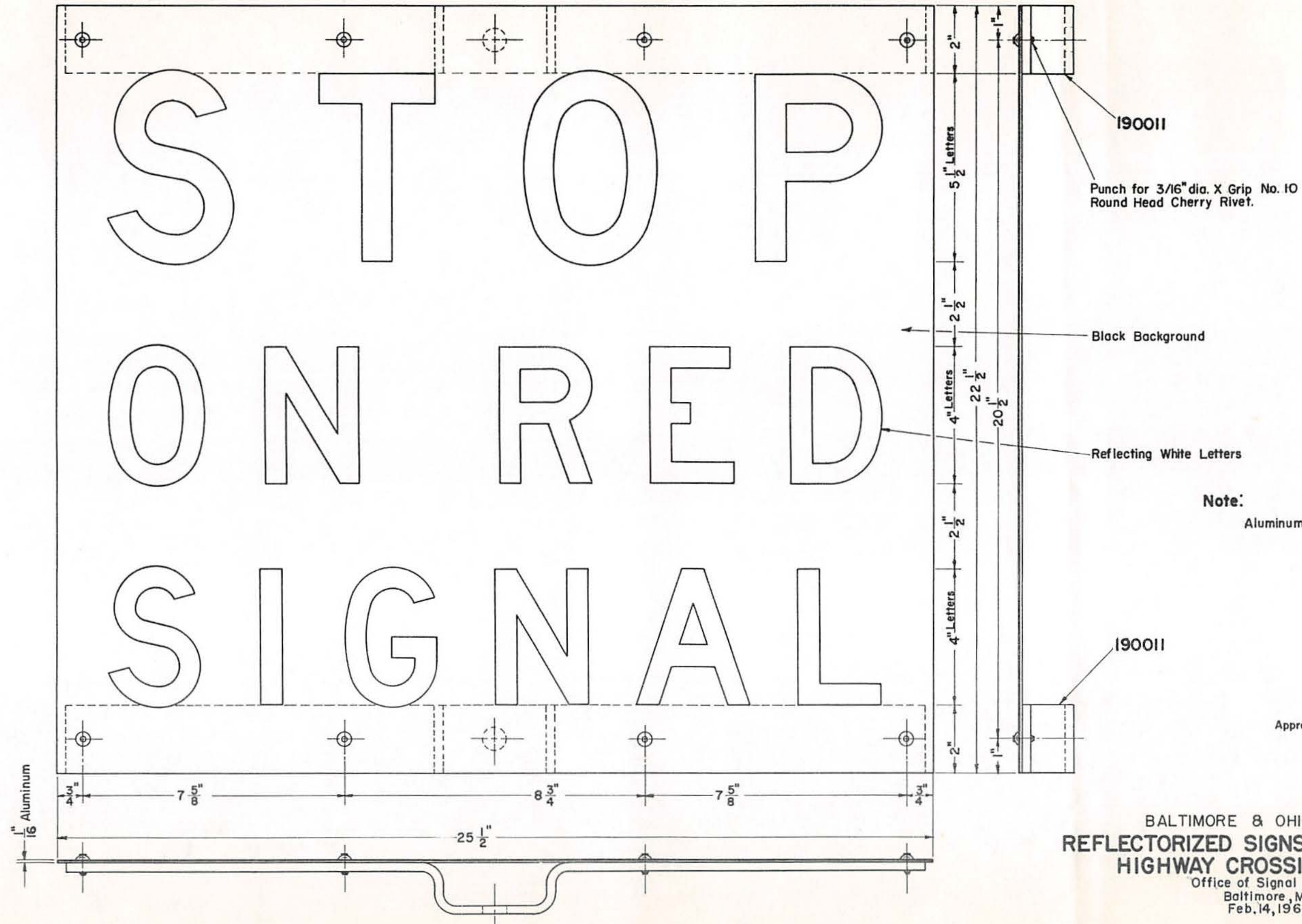
REFLECTORIZED SIGNS & FITTINGS FOR HIGHWAY CROSSING SIGNALS

Office of Signal Engineer
Baltimore, Md.
Feb. 14, 1962

R.I.-W.J.G.

Sheet No. 4

S-190-C


STOP
ON RED
SIGNAL
2"
5 1/2" Letters
2 1/2"
4" Letters
2 1/2"
4" Letters
2"
22 1/2"
20 1/2"
1"
1"
190011
Punch for 3/16" dia. X Grip No. 10 Round Head Cherry Rivet.
Black Background
Reflecting White Letters
190011
3/4"
7 5/8"
8 3/4"
7 5/8"
3/4"
25 1/2"
1/16" Aluminum

Note:

Aluminum-K150-D

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

REFLECTORIZED SIGNS & FITTINGS FOR HIGHWAY CROSSING SIGNALS

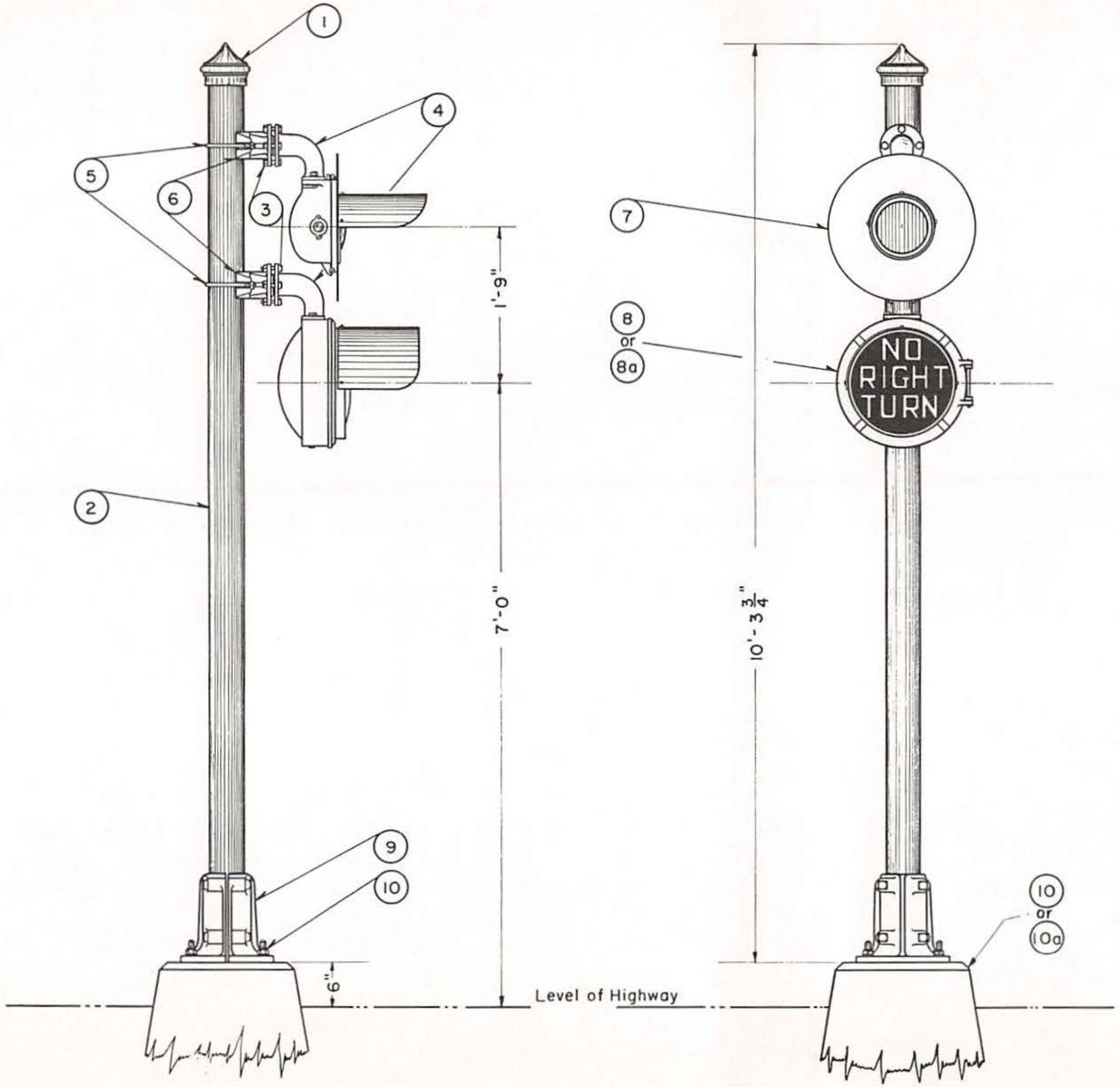
Office of Signal Engineer
Baltimore, Md.
Feb. 14, 1962

R.I.-W.J.G.

REFLECTORIZED STOP ON RED SIGNAL SIGN-190010

Sheet No. 5

S-190-C



ITEM	DESCRIPTION	DRAWING
1	Short Pinnacle No.12452	S-362-B
2	4"dia. x 10'-0" Pipe Mast	
3	1/2"-13x2 1/2" Machine Bolts with Sq. Nuts.	
4	Bracket, A.A.R. 14851.	S-458
5	"U" Bolt, for 4' pipe, A.A.R. 16554	S-421
6	Adapter Clamp, A.A.R. 14841	S-457
7	Flashing Light Signal Unit, Type No. 950, with 30° Spreadlite Yellow Roundel. W.R.R.S. Co.	950-201
8	Electric Light Unit, Illuminated Highway Crossing Sign, "NO RIGHT TURN" Assembly, A.A.R. 14811.	S-455
8a	Electric Light Unit, Illuminated Highway Crossing Sign, "NO LEFT TURN" Assembly, A.A.R. 14812	S-455
9	Base for 4" Mast, A.A.R. 14492	S-394
10	Foundation For Flashing Light Signal No. 1247.	S-124-D-sh.1
10 a	Foundation For AAR Base No.14492-12417	S-124-D-sh.6

NOTES:

Painting shall be in accordance with Current Instructions I-134.

Specify whether "NO RIGHT TURN" or "NO LEFT TURN" assembly is required.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
"NO TURN"
HIGHWAY CROSSING SIGN
Office of Signal Engineer
Baltimore, Md.
Mar. 13, 1959

7-6-49: New Plan Made.
4-25-50: Adopted.
3-13-59: Revised.

S-191-A

Item	Use	Dia. Inches	Focus	Description	Color	Mould Marking	Reference			
							Figure	Plate	Drawing	Manufacture
1	Type "U" C P L Signal	5-1/2	1/2	Inner Doublet	Green	5-1/2 D. x 1/2F. I.D.	39	H4001	43988	G.R.S.Co.
2	Type "U" C P L Signal	5-1/2	1/2	Inner Doublet	Yellow	5-1/2 D. x 1/2F. I.D.	40	H4001	43988-1	G.R.S.Co.
3	Type "U" C P L Signal	5-1/2	1/2	Inner Doublet	Red	5-1/2 D. x 1/2F. I.D.	41	H4001	43988-2	G.R.S.Co.
4	Type "U" C P L Signal	5-1/2	1/2	Inner Doublet	Clear	5-1/2 D. x 1/2F. I.D.	42	H4001	43988-3	G.R.S.Co.
5	Type "U" C P L Signal	5-1/2	1/2	Inner Doublet	E. Lunar White	5-1/2 D. x 1/2F. I.D.	44	H4001	43988-5	G.R.S.Co.
6	Type "U" C P L Signal	8-3/8	4	Outer Doublet 40° Deflecting Bullseye	Clear	8-3/8D. x 4F. O.D. 40°Def. BE#54105	9	H4001	43987-12	G.R.S.Co.
7	Type "U" C P L Signal	8-3/8	4	Outer Doublet 30° Spread	Clear	8-3/8D x 4F. O.D.#54097	11	H4001	43987-15	G.R.S.Co.
8	Type "V" C P L Dwarf Signal	3-1/2	2-1/4	Optical	Green	3-1/2D. x 2-1/4 F.S.O.	85	H4001	46762	G.R.S.Co.
9	Type "V" C P L Dwarf Signal	3-1/2	2-1/4	Optical	Clear	3-1/2D. x 2-1/4 F.S.O.	86	H4001	46762-1	G.R.S.Co.
10	Type "V" C P L Dwarf Signal	3-1/2	2-1/4	Optical	Yellow	3-1/2D. x 2-1/4 F.S.O.	87	H4001	46762-2	G.R.S.Co.
11	Type "V" C P L Dwarf Signal	3-1/2	2-1/4	Optical	Red	3-1/2D. x 2-1/4 F.S.O.	88	H4001	46762-3	G.R.S.Co.
12	Type "V" C P L Dwarf Signal	3-1/2	2-1/4	Optical	E. Lunar White	3-1/2D. x 2-1/4 F.S.O.	91	H4001	46762-6	G.R.S.Co.
13	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Green	2-3/4D. x 3/8F. I.D. #54259	94	H4001	56901	G.R.S.Co.
14	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Yellow	2-3/4D. x 3/8F. I.D. #54259	95	H4001	56901-1	G.R.S.Co.
15	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Red	2-3/4D. x 3/8F. I.D. #54259	96	H4001	56901-2	G.R.S.Co.
16	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	E. Lunar White	2-3/4D. x 3/8F. I.D. #54259	97	H4001	56901-3	G.R.S.Co.
17										
18	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Clear	2-3/4D. x 3/8F. I.D.#54259	99	H4001	56901-5	G.R.S.Co.
19	Type "VA" CPL Dwarf Signal	4	2-1/4	Optical	Clear	4D. x 2-1/4F.S.O. # 54007	76	H4001	56902	G.R.S.Co.
20	Type "VA" CPL Dwarf Signal	4		Convex 20° Deflecting	Clear	4D. 20° Defl.#55476	107	H4003	9238-78	G.R.S.Co.
21	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel	Red		52	B-2911	8468-52	U.S.&S.Co.
22	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel	Lunar White		52b	B-2911	8468-52	U.S.&S.Co.
23	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel (Sandblasted on front side only.)	Clear		52d	B-2911	8468-52	U.S.&S.Co.
24										
25	Style "ES-20" Switch Signal (Note 1)	3-1/2		Clear Lens			51	B-2911	B-8276-32	U.S.&S.Co.
26	Style "ES-20" Switch Signal (Note 1)	3-1/2		20° Flat Spreader Roundel	Yellow		52a	B-2911	8468-52	U.S.&S.Co.
27	Style "ES-20" Switch Signal (Note 1)	3-1/2		20° Flat Spreader Roundel	Green		52c	B-2911	8468-52	U.S.&S.Co.
28	Type "P" CL Switch Signal	5-3/8		Convex 20° Deflecting	Yellow	5-3/8D. x 20° Defl. C.G. code 55111	84	H4003	9238-34	G.R.S.Co.
29	Type "P" CL Switch Signal	5-3/8		Convex 20° Deflecting	Green	5-3/8D. x 20° Defl. C.G. code 55111	85	H4003	9238-35	G.R.S.Co.
30	Type "P" CL Switch Signal	5-3/8	2-1/4	Inverted	Clear	5-3/8D. x 2-1/4F. I.L. #54108	36	H4001	47585-3	G.R.S.Co.
31	Types "XA" & "XC" Hwy. Crossing Signals	8-3/8		Convex 30° Spread	Traffic Red	8-3/8D. N.F. Cover 30° Spread	27	H4003	53142-6	G.R.S.Co.
32	Types "XA" & "XC" Hwy. Crossing Signals	8-3/8		Convex 30° Spread 15° Deflecting	Traffic Red	8-3/8D. # 55304	32	H4003	53142-11	G.R.S.Co.
33	Types 818-880 & 950 Hwy. Crossing Sigs.	8-3/8		Convex 30° Spread	Red		4	D380	CL17	WRRS Co.
34	Types 818-880 & 950 Hwy. Crossing Sigs.	8-3/8		Convex 30° Spread 20° Deflecting	Red		4a	D380	5321	WRRS Co.
35	Flashing Yellow Type 880 Hwy. Crossing Sigs.	8-3/8		Convex 30° Spread	Yellow			D495		WRRS Co.

NOTES:

1. Items 25, 26, and 27 may also be used for style "G" C.P.L. Dwarf Signal.
2. Wire Mesh Screens for Type "U" C.P.L. High Signals, Dwg. No. 48885-3.
3. Wire Mesh Screens for Type "VA" C.P.L. Dwarf Signals, Ref. 57, Plate H-3511, Dwg. No. 48885-2.

BALTIMORE & OHIO RAILROAD
LENSES AND ROUNDELS
USED BY SIGNAL DEPARTMENT
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Dec. 22, 1949

Sheet No 1

S-193-A

Adopted: 4-25-50.
Rev Nov 21, 1950 - Item 17 removec

Item	Use	Dia. Inches	Focus	Description	Color	Mould Marking	Reference			
							Figure	Plate	Drawing	Manufacture
41	Illuminated Sign	14		Glass Stencil "NO LEFT TURN"	Clear Letters on Black Background		19	K162	8163-314	U.S.& S.Co.
42	Illuminated Sign	14		Glass Stencil "NO RIGHT TURN"	Clear Letters on Black Background		19a	K162	8163-313	U.S.& S.Co.
43	Illuminated Sign	14		Glass Stencil Letter "S"	Clear Letters on Black Background		19b	K162	8163-323	U.S.& S.Co.
44	Illuminated Sign	14		Convex Cover Glass	Clear		20	K162	8163-315	U.S.& S.Co.
45	Model 5 Auto. Flag	6-3/8	3-1/2	Convex Spreadlite	Red					W.R.S.Co.
46	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Red				14147	AAR
47	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Yellow				14148	AAR
48	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Green				14149	AAR
49	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Lunar White				141410	AAR
50	Semaphore Lamps AAR Dwg. 1100B	5-3/8	3-1/2	Optical	Clear	5-3/8D.x 3-1/2F.S.O.	18	H4001	31624-1	G.R.S.Co.
51	Electric Lamp Case for Semaphore Signal	5-3/8		Convex Roundel	Clear	5-3/8 Convex Roundel	96	H4003	9244-1	G.R.S.Co.
52	Mechanical Dwarf Signal	5-3/8		Convex Roundel	Red				14141	AAR
53	Mechanical Dwarf Signal	5-3/8		Convex Roundel	Lunar White				14144	AAR
54	Switch Lamp AAR 1460B	5-3/8		Convex	Red			Adams Westlake or Equivalent		
55	Switch Lamp AAR 1460B	5-3/8		Convex	Yellow			Adams Westlake or Equivalent		
56	Switch Lamp AAR 1460B	5-3/8		Convex	Green			Adams Westlake or Equivalent		
57	Switch Lamp AAR 1460B	5-3/8		Convex	Purple					
Lenses and Roundels for Foreign Railroad Signals maintained by Baltimore & Ohio										
63	P.L. Dwarf Signal	4		Convex Sandblasted	Clear		6b	B2426	8468-66	U.S.& S.Co.
64	P.L. High Signal	5-3/8		Conical Cover Glass	Yellow		38	B2438	8468-29	U.S.& S.Co.
65	P.L. High Signal			Light Deflecting Prism			36	B2438	B-8276-82	U.S.& S.Co.
66	Style "N" C.L. Signal	5-1/2		Inner Lens	Green		3	B2532	B-8276-23	U.S.& S.Co.
67	Style "N" C.L. Signal	5-1/2		Inner Lens	Yellow		3a	B2532	B-8276-23	U.S.& S.Co.
68	Style "N" C.L. Signal	5-1/2		Inner Lens	Red		3b	B2532	B-8276-23	U.S.& S.Co.
69	Style "N" C L Signal	6-3/8		Outside Lens	Clear		8	B2532	B-8276-30	U.S.& S.Co.
70	Searchlight C.L. Signal	8-3/8	5	Outer Lens with 40° center deflecting prism	Clear		11	B2825	B-8276-41	U.S.& S.Co.
71	Type "SA" C.L. Signal	8-3/8	11-1/2	Plano Convex	Clear		14	H4001	54249-2	G.R.S.Co.
72	Type "SA" C.L. Signal	8-3/8		Convex Cover Glass 20° Deflecting	Clear	8-3/8D. 20° Defl. Cover	8	H4003	9238-38	G.R.S.Co.
73	Type "F" C.L. Dwarf Signal	5		Convex Cover Glass 40° Deflecting	Clear	5D. 40° Defl. Cover	106	H4003	9238-39	G.R.S.Co.
74	Type "F" C.L. Dwarf Signal	5	2-3/4	Outer Doublet Toric	Clear	5D x 2 3/4" O.D. 20° H.T. Pat. 6-24-19	57	H4001	45930-1	G.R.S.Co.
75	Type "F" C.L. Dwarf Signal	3-5/8	5/8	Inner Doublet	Red	3 5/8D. x 5/8" F. I.D.	80	H4001	45926-3	G.R.S.Co.
76	Type "F" C.L. Dwarf Signal	3-5/8	5/8	Inner Doublet	Yellow	3 5/8D. x 5/8" F. I.D.	79	H4001	45926-2	G.R.S.Co.

Approved
Chief Eng'r Comm. & Sigs

BALTIMORE & OHIO RAILROAD

LENSES AND ROUNDELS USED BY SIGNAL DEPARTMENT

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Dec. 22, 1949

Sheet No. 2

S-193-A

Adopted: 4-25-50
Revised Nov 21, 1950-Item 50, Fig
ed to B

Item	Use	Dia. Inches	Focus	Description	Color	Mould Marking	Reference			
							Figure	Plate	Drawing	Manufacture
1	Type "U" CPL Signal	5-1/2	1/2	Inner Doublet	Green	5-1/2D. x 1/2F. I.D.	39	H4001	43988	G.R.S.Co.
2	Type "U" CPL Signal	5-1/2	1/2	Inner Doublet	Yellow	5-1/2D. x 1/2F. I.D.	40	H4001	43988-1	G.R.S.Co.
3	Type "U" CPL Signal	5-1/2	1/2	Inner Doublet	Red	5-1/2D. x 1/2F. I.D.	41	H4001	43988-2	G.R.S.Co.
4	Type "U" CPL Signal	5-1/2	1/2	Inner Doublet	Clear	5-1/2D. x 1/2F. I.D.	42	H4001	43988-3	G.R.S.Co.
5	Type "U" CPL Signal	5-1/2	1/2	Inner Doublet	E. Lunar White	5-1/2D. x 1/2F. I.D.	44	H4001	43988-5	G.R.S.Co.
6	Type "U" CPL Signal	8-3/8	4	Outer Doublet 40° Deflecting Bullseye	Clear	8-3/8D. x 4F.O.D. 40°Def. BE#541050	9	H4001	43987-12	G.R.S.Co.
7	Type "U" CPL Signal	8-3/8	4	Outer Doublet 30° Spread	Clear	8-3/8D x 4F.O.D.#540970.	11	H4001	43987-15	G.R.S.Co.
8	Type "V" CPL Dwarf Signal	3-1/2		Flat 20° Spread	Green	3-1/2D. x F. Rdl., 20° Spread.	123	H4003	9238-55	G.R.S.Co.
9	Type "V" CPL Dwarf Signal	3-1/2		Flat 20° Spread (Sandblasted)	Clear	3-1/2D. x F. Rdl. 20° Spread	122	H4003	9238-54	G.R.S.Co.
10	Type "V" CPL Dwarf Signal	3-1/2		Flat 20° Spread	Yellow	3-1/2D. x F. Rdl. 20° Spread	123a	H4003	9238-56	G.R.S.Co.
11	Type "V" CPL Dwarf Signal	3-1/2		Flat 20° Spread	Red	3-1/2D. x F. Rdl. 20° Spread	124	H4003	9238-57	G.R.S.Co.
12	Type "V" CPL Dwarf Signal	3-1/2		Flat 20° Spread	E. Lunar White	3-1/2D. x F. Rdl. 20° Spread	125	H4003	9238-58	G.R.S.Co.
13	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Green	2-3/4D. x 3/8F. I.D. #542590	94	H4001	56901	G.R.S.Co.
14	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Yellow	2-3/4D. x 3/8F. I.D. #542590	95	H4001	56901-1	G.R.S.Co.
15	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Red	2-3/4D. x 3/8F. I.D. #542590	96	H4001	56901-2	G.R.S.Co.
16	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	E. Lunar White	2-3/4D. x 3/8F. I.D. #542590	97	H4001	56901-3	G.R.S.Co.
17										
18	Type "VA" CPL Dwarf Signal	2-3/4	3/8	Inner Doublet	Clear	2-3/4D. x 3/8F. I.D.#542590	99	H4001	56901-5	G.R.S.Co.
19	Type "VA" CPL Dwarf Signal	4	21/4	Optical	Clear	4D. x 2-1/4F. S.O. # 540070	76	H4001	56902	G.R.S.Co.
20	Type "VA" CPL Dwarf Signal	4		Convex 20° Deflecting	Clear	4D. 20° Defl.#554760	107	H4003	9238-78	G.R.S.Co.
21	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel	Red		52	B-2911	8468-52	U.S.&S.Co.
22	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel	Lunar White		52b	B-2911	8468-52	U.S.&S.Co.
23	Style "G" CPL Dwarf Signal	3-1/2		20° Flat Spreader Roundel (Sandblasted on front side only.)	Clear		52d	B-2911	8468-52	U.S.&S.Co.
24										
25	Style "ES-20" Switch Signal (Note 1)	3-1/2		Clear Lens			51	B-2911	B-8276-32	U.S.&S.Co.
26	Style "ES-20" Switch Signal (Note 1)	3-1/2		20° Flat Spreader Roundel	Yellow		52a	B-2911	8468-52	U.S.&S.Co.
27	Style "ES-20" Switch Signal (Note 1)	3-1/2		20° Flat Spreader Roundel	Green		52c	B-2911	8468-52	U.S.&S.Co.
28	Type "P" CL Switch Signal	5-3/8		Convex 20° Deflecting 18° Spread	Yellow	5-3/8D. x 20° Vrt.Def., 18° Hor. Sprd.	84	H4003	9238-91	G.R.S.Co.
29	Type "P" CL Switch Signal	5-3/8		Convex 20° Deflecting 18° Spread	Green	5-3/8D. x 20° Vrt.Def., 18° Hor. Sprd.	85	H4003	9238-92	G.R.S.Co.
30	Type "P" CL Switch Signal	5-3/8	2-1/4	Inverted	Clear	5-3/8D. x 2-1/4F. I.L. #541080	36	H4001	47585-3	G.R.S.Co.
31	Types "XA" & "XC" Hwy. Crossing Signals	8-3/8		Convex 20° Spread 32° Deflecting	Highway Crossing Red	8-3/8D. Cvx. 20° Spr'd. 32° Defl. #554721	34	H4003	53142-13	G.R.S.Co.
32	Types "XA" & "XC" Hwy. Crossing Signals	8-3/8		Convex 30° Spread 15° Deflecting	Highway Crossing Red	8-3/8D. # 553311	32	H4003	53142-11	G.R.S.Co.
33	Types 818-880 & 950 Hwy. Crossing Sigs.	8-3/8		Convex 30° Spread	Red		4	D380	CL17	WRRS Co.
34	Types 818-880 & 950 Hwy. Crossing Sigs.	8-3/8		Convex 20° Deflecting Roundel	Red		4a	D380	5321	WRRS Co.
35	Flashing Yellow Type 880 Hwy. Crossing Sigs.	8-3/8		Convex 30° Spread	Yellow			D495		WRRS Co.

NOTES:

1. Items 25, 26, and 27 may also be used for style "G" C.P.L. Dwarf Signal.
2. Wire Mesh Screens for Type "U" C.P.L. High Signals, Dwg. No. 48885-3.
3. Wire Mesh Screens for Type "VA" C.P.L. Dwarf Signals, Ref. 57, Plate H-3511, Dwg. No. 48885-2.

BALTIMORE & OHIO RAILROAD

LENSES AND ROUNDELS USED BY SIGNAL DEPARTMENT

Office of Signal Engineer
Baltimore, Md.
June 20, 1958

Sheet No. 1

S-193-D

Made & Corrected 12-22-49.
Adopted: 4-25-50.
Revised Nov. 21, 1950-Item 17 removed.
Revised: 11-18-52-Items 28 to 31 incl. changed.
Revised: 2-28-57.
Revised: 6-20-57-Item 34 revised.

Item	Use	Dia. Inches	Focus	Description	Color	Mould Marking	Reference			
							Figure	Plate	Drawing	Manufacture
41	Illuminated Sign	14		Glass Stencil "NO LEFT TURN"	Clear Letters on Black Background		19	K162	8163-314	U.S.&S.Co.
42	Illuminated Sign	14		Glass Stencil "NO RIGHT TURN"	Clear Letters on Black Background		19a	K162	8163-313	U.S.&.S.Co.
43	Illuminated Sign	14		Glass Stencil Letter "S"	Clear Letters on Black Background			K162	8163-323	U.S.& S.Co.
44	Illuminated Sign	14		Convex Cover Glass	Clear		20	K162	8163-315	U.S.&S.Co.
45	Model 5 Auto. Flag	6-3/8	3-1/2	Convex Spreadlite	Red					W.R.S.Co.
46	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Red				14147	AAR
47	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Yellow				14148	AAR
48	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Green				14149	AAR
49	Semaphore High Signal Spectacle	8-3/8		Convex Roundel	Lunar White				141410	AAR
50	Semaphore Lamps AAR Dwg. 1100B	5-3/8	3-1/2	Optical	Clear	5-3/8D.x 3-1/2F.S.O.	18	H4001	31624-1	G.R.S.Co.
51	Electric Lamp Case for Semaphore Signal	5-3/8		Convex Roundel	Clear	5-3/8 Convex Roundel	96	H4003	9244-1	G.R.S.Co.
52	Mechanical Dwarf Signal	5-3/8		Convex Roundel	Red				14141	AAR
53	Mechanical Dwarf Signal	5-3/8		Convex Roundel	Lunar White				14144	AAR
54	Switch Lamp AAR 1460B	5-3/8		Convex	Red			Adams Westlake or Equivalent		
55	Switch Lamp AAR 1460B	5-3/8		Convex	Yellow			Adams Westlake or Equivalent		
56	Switch Lamp AAR 1460B	5-3/8		Convex	Green			Adams Westlake or Equivalent		
57	Switch Lamp AAR 1460B	5-3/8		Convex	Purple					
	Lenses and Roundels for Foreign Railroad Signals maintained by Baltimore & Ohio									
63	P.L. Dwarf Signal	4		20° Flat Spreadlite (Sandblasted)	Clear		6b	B2426	8468-66	U.S.&S.Co.
64	P.L. High Signal	5-3/8		Conical Cover Glass	Yellow		38	B2438	8468-29	U.S.&S.Co.
65	P.L. High Signal			Light Deflecting Prism			36	B2438	B-8276-82	U.S.&S.Co.
66	Style "N" C.L. Signal	5-1/2		Inner Lens	Green		3	B2532	B-8276-23	U.S.&S.Co.
67	Style "N" C.L. Signal	5-1/2		Inner Lens	Yellow		3a	B2532	B-8276-23	U.S.&S.Co.
68	Style "N" C.L. Signal	5-1/2		Inner Lens	Red		3b	B2532	B-8276-23	U.S.&S.Co.
69	Style "N" C L Signal	6-3/8		Outside Lens	Clear		8	B2532	B-8276-30	U.S.&S.Co.
70	Searchlight C.L. Signal	8-3/8	5	Outer Lens with 40° center deflecting prism	Clear		11	B2825	B-8276-41	U.S.&S.Co.
71	Type "SA" C.L. Signal	8-3/8	11-1/2	Plano Convex	Clear		14	H4001	54249-2	G.R.S.Co.
72	Type "SA" C.L. Signal	8-3/8		Convex Cover Glass 20° Deflecting	Clear	8-3/8D. 20° Defl. Cover #2	8	H4003	9238-38	G.R.S.Co.
73	Type "F" C.L. Dwarf Signal	5		Convex Cover Glass 40° Deflecting	Clear	5D. 40° Defl. Cover	106	H4003	9238-39	G.R.S.Co.
74	Type "F" C.L. Dwarf Signal	5	2-3/4	Outer Doublet Toric	Clear	5D. x 2 3/4"F.O.D. 20° H.T. Pat. 6-24-19.	57	H4001	45930-1	G.R.S.Co.
75	Type "F" C.L. Dwarf Signal	3-5/8	5/8	Inner Doublet	Red	3 5/8D. x 5/8"F. I.D.	80	H4001	45926-3	G.R.S.Co.
76	Type "F" C.L. Dwarf Signal	3-5/8	5/8	Inner Doublet	Yellow	3 5/8D. x 5/8"F. I.D.	79	H4001	45926-2	G.R.S.Co.

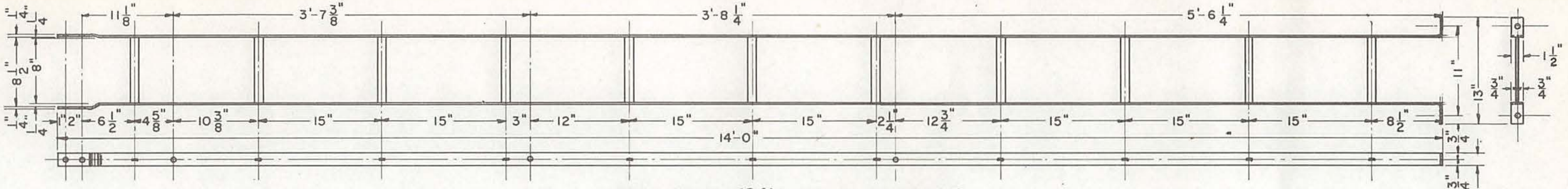
Made & Corrected: 12-22-49.
Adopted 4-25-50
Revised 11-21-50-Item 50, Fig. 27 changed to 18.
Revised 2-28-57.

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LENSES AND ROUNDELS
USED BY SIGNAL DEPARTMENT
Office of Signal Engineer
Baltimore, Md.
June 20, 1958

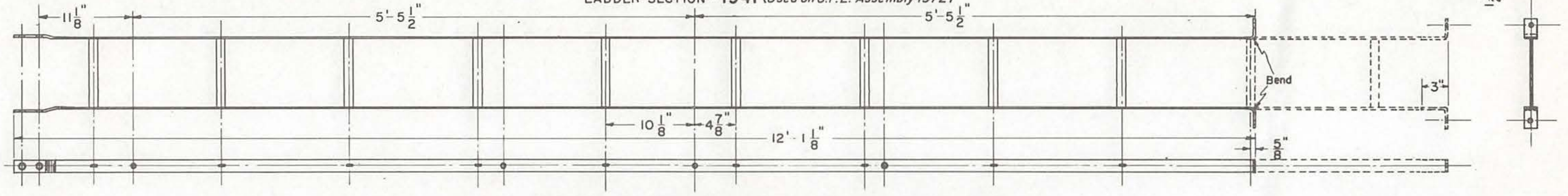
Sheet No. 2

S-193-D



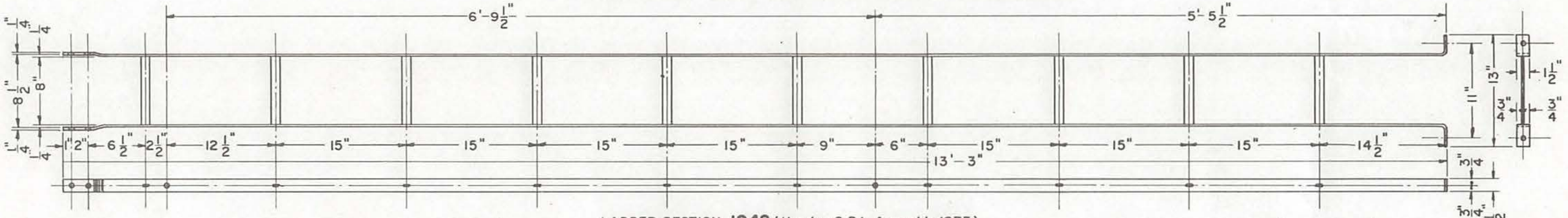
11 1/8"
3'-7 3/8"
3'-8 1/4"
5'-6 1/4"
1/4"
8 1/2"
8"
1"
2"
6 1/2"
4 5/8"
10 3/8"
15"
3"
12"
2 1/4"
12 3/4"
8 1/2"
14'-0"
11"
13"
1 1/2"
3/4"
3/4"
1 1/2

LADDER SECTION - **1941** (*Used on C.P.L. Assembly 1972*)



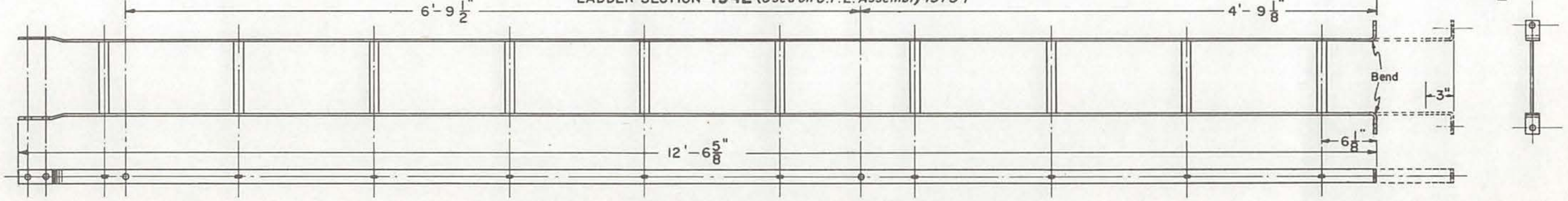
11 1/8"
5'-5 1/2"
5'-5 1/2"
Bend
3"
10 1/8"
4 7/8"
12'-1 1/8"
5/8"

LADDER SECTION - **1941-M** (Modified 1941) (*Used on C.P.L. Assembly 1972-M*)



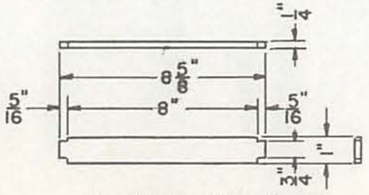
6'-9 1/2"
5'-5 1/2"
1/4"
8 1/2"
8"
1"
2"
6 1/2"
2 1/2"
12 1/2"
15"
9"
6"
14 1/2"
13'-3"
11"
13"
1 1/2"
3/4"
3/4"
1 1/2

LADDER SECTION - **1942** (*Used on C.P.L. Assembly 1973*)



6'-9 1/2"
4'-9 1/8"
Bend
3"
6 1/8"
12'-6 5/8"

LADDER SECTION - **1942-M** (Modified 1942) (*Used on C.P.L. Assembly 1973-M*)



1/4"
8 5/8"
8"
5/16"
5/16"
1"
3/4"

Detail of Ladder Rungs

NOTES:

All holes to be 9/16" diameter.
Ladders & Rungs C-1020 steel.

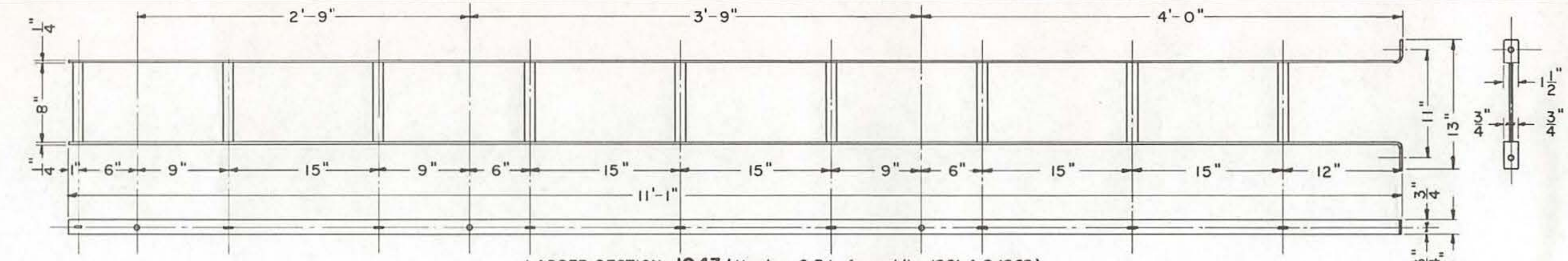
Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
LADDERS FOR
COLOR POSITION LIGHT SIGNALS
Office of Signal Engineer
Baltimore, Md.
Mar. 1, 1962

Sheet No. 1

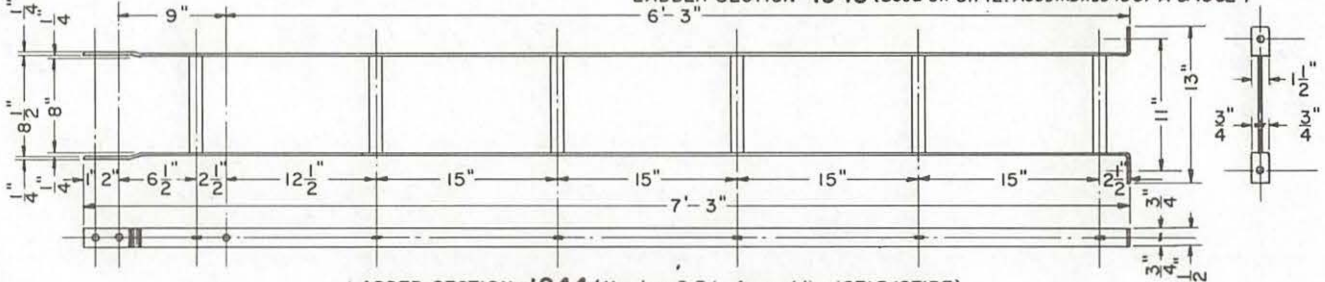
S-194-A

3-1-62:- New plan made account n & mast.



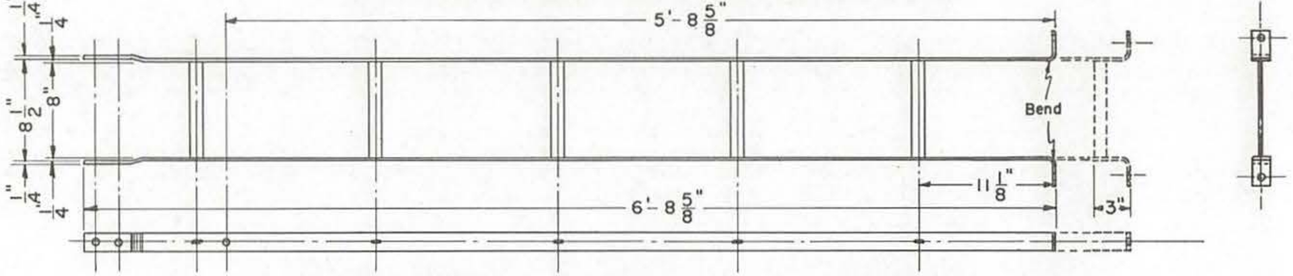
2'-9"
3'-9"
4'-0"
1/4"
8"
1/4"
1"
6"
9"
15"
9"
6"
15"
15"
9"
6"
15"
15"
12"
11'-1"
11"
13"
1 1/2"
3/4"
3/4"
3/4"
3/4"
1 1/2

LADDER SECTION **-1943** *(Used on C.P.L. Assemblies 1961-A & 1962)*



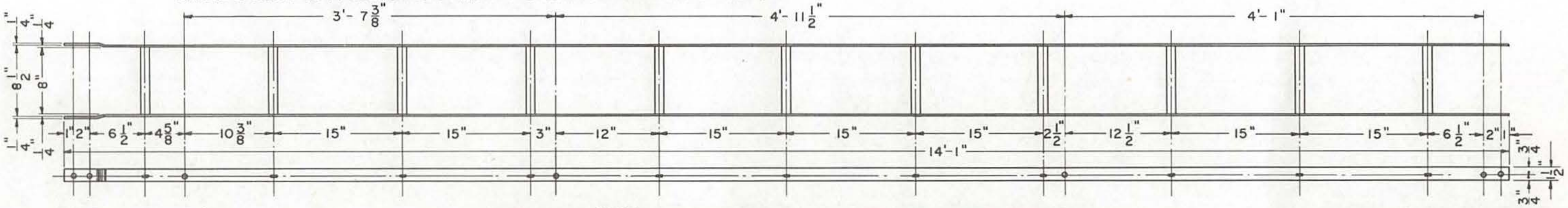
9"
6'-3"
1/4"
1/4"
8 1/2"
8"
1/4"
1/4"
1"
2"
6 1/2"
2 1/2"
12 1/2"
15"
15"
15"
15"
2 1/2"
7'-3"
11"
13"
1 1/2"
4 3/4"
4 3/4"
3/4"
3/4"
1 1/2

LADDER SECTION **-1944** *(Used on C.P.L. Assemblies 1971 & 1971BR)*



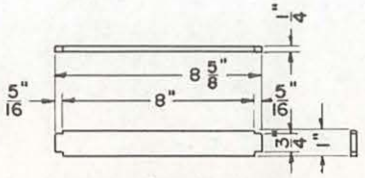
5'-8 5/8"
1/4"
1/4"
8 1/2"
8"
1/4"
1/4"
Bend
11 1/8"
6'-8 5/8"
3"

LADDER SECTION **-1944-M** (Modified 1944) *(Used on C.P.L. Assemblies 1971-M & 1971-MBR)*



3'-7 3/8"
4'-11 1/2"
4'-1"
1/4"
1/4"
8 1/2"
8"
1/4"
1/4"
1"
2"
6 1/2"
4 5/8"
10 3/8"
15"
15"
3"
12"
15"
15"
15"
2 1/2"
12 1/2"
15"
15"
6 1/2"
2"
1"
14'-1"
3/4"
1 1/2"
3/4"

LADDER SECTION **-1945** *(Used on C.P.L. Assemblies 1971, 1971BR, 1971M, 1971MBR, 1973 & 1973-M)*



1/4"
8 5/8"
5/16"
8"
5/16"
3/4"
1"

Detail of Ladder Rungs

NOTES:

All holes to be 9/16" diameter.
Ladders & Rungs–C-1020 steel.

Approved: a L Jordan
Signal Engineer

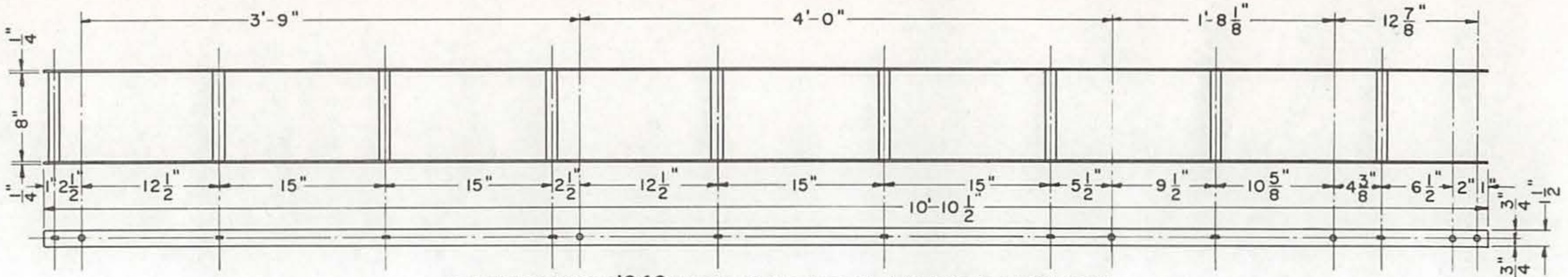
BALTIMORE & OHIO RAILROAD

LADDERS FOR
COLOR POSITION LIGHT SIGNALS

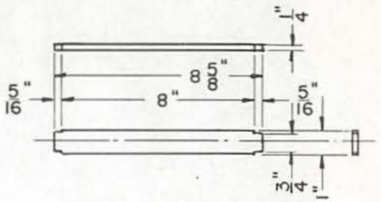
Office of Signal Engineer
Baltimore, Md.
Mar. 1, 1962

Sheet No. 2

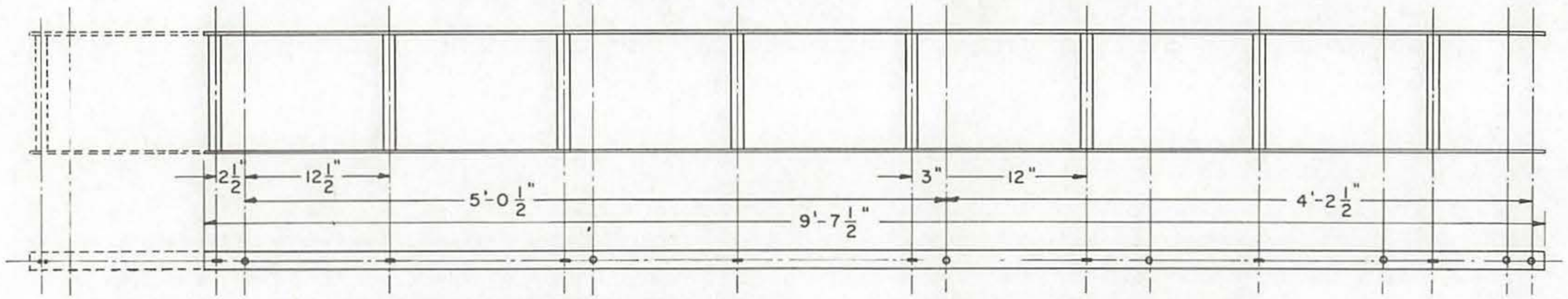
S-194-A


3'-9"
4'-0"
1'-8 1/8"
12 7/8"
1/4"
8"
1/4"
1"
2 1/2"
12 1/2"
15"
15"
2 1/2"
12 1/2"
15"
15"
5 1/2"
9 1/2"
10 5/8"
4 3/8"
6 1/2"
2"
1"
1/2"
10'-10 1/2"
3/4"
3/4"

LADDER SECTION - **1946** (*Used on C. P. L. Assembly 1971, 1971BR, 1972 & 1973*)


1/4"
8 5/8"
5/16"
8"
5/16"
3/4"

Detail of Ladder Rungs


2 1/2"
12 1/2"
3"
12"
5'-0 1/2"
4'-2 1/2"
9'-7 1/2"

LADDER SECTION - **1946-M** (Modified 1946) (*Used on C.P.L. Assembly 1971-M, 1971-MBR, 1972-M & 1973-M*)

NOTES:

All holes to be 9/16" diameter.
Ladders & Rungs - C-1020 steel.

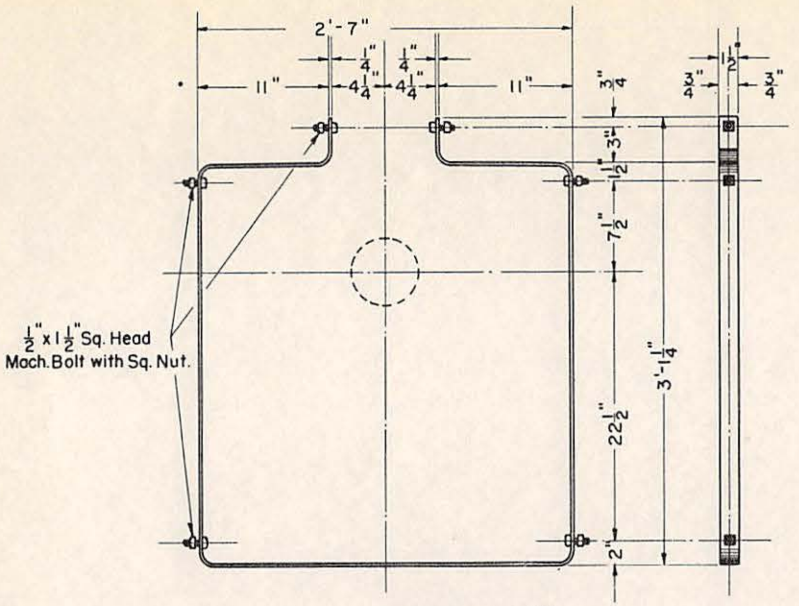
BALTIMORE & OHIO RAILROAD

LADDERS FOR
COLOR POSITION LIGHT SIGNALS

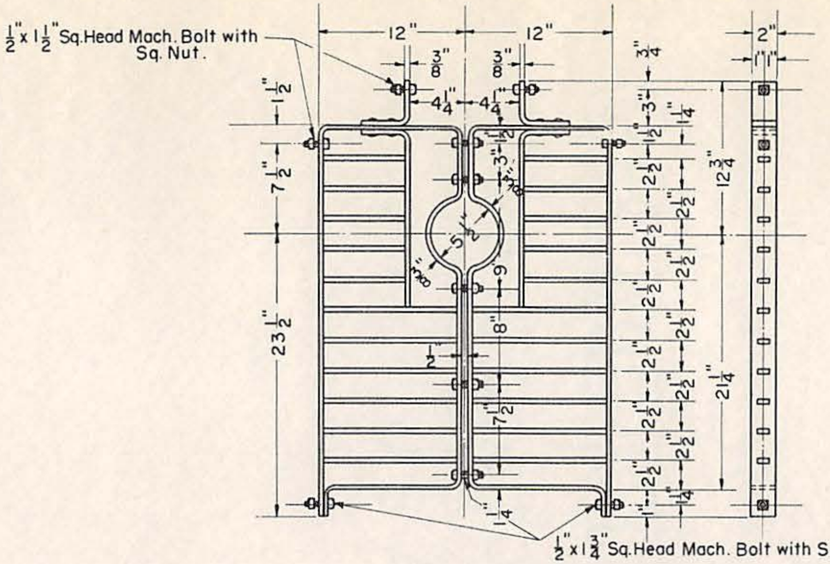
Office of Signal Engineer
Baltimore, Md.
Mar. 1, 1962

Approved: A L Jordan
Signal Engineer

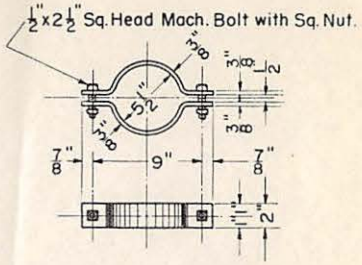
Sheet No. 3 S-194-A


2'-7"
11"
4¼"
4¼"
11"
¼"
¼"
¾"
½"
¾"
¾"
3"
1½"
7½"
22½"
3'-1¼"
2"
½"x1½" Sq. Head Mach. Bolt with Sq. Nut.

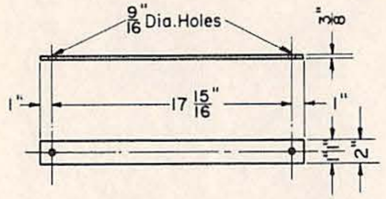
HANDRAIL - 1951


½"x1½" Sq.Head Mach. Bolt with Sq. Nut.
12"
12"
2"
1"
⅜"
⅜"
¾"
4¼"
4¼"
1½"
7½"
23½"
5½"
9"
8"
7½"
3"
1¼"
12¾"
21¼"
2½"
¼"
½"x1¾" Sq.Head Mach. Bolt with Sq. Nut.

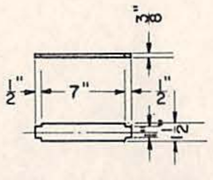
LADDER PLATFORM - 1952


½"x2½" Sq.Head Mach. Bolt with Sq. Nut.
5½"
⅜"
⅜"
½"
⅞"
9"
⅞"
1"
2"

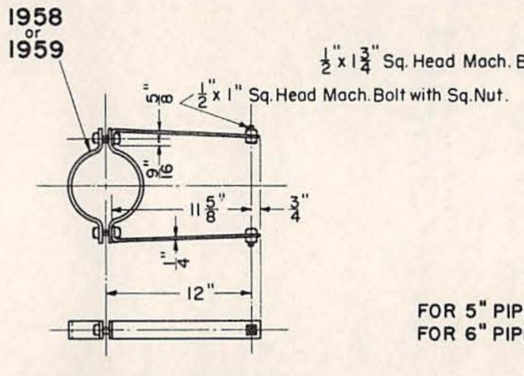
BRACE CLAMP - 1957


9/16" Dia.Holes
⅜"
1"
17 15/16"
1"
1"
2"

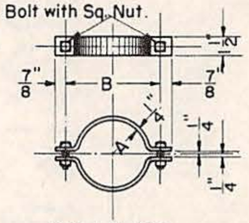
PLATFORM BRACE - 1953



PLATFORM RUNG DETAILS


1958
or
1959
⅝"
½"x1" Sq.Head Mach. Bolt with Sq.Nut.
9/16"
11⅝"
¾"
¼"
12"

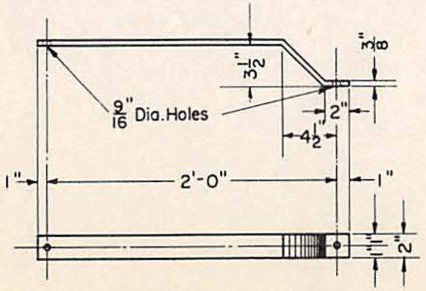
LADDER STAY COMPLETE
FOR 5" PIPE - 1955
FOR 6" PIPE - 1956


½"x1¾" Sq. Head Mach. Bolt with Sq. Nut.
½"
⅞"
B
⅞"
A
¼"
¼"
¼"

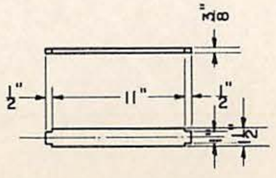
PIPE CLAMP
FOR 5" PIPE - A = 2 3/4" - B = 7 3/4" - 1958
FOR 6" PIPE - A = 3 5/16" - B = 8 7/8" - 1959

Notes:

Material to be C-1020 steel.


⅜"
3½"
9/16" Dia.Holes
2"
4½"
1"
2'-0"
1"
1"
2"

HANDRAIL BRACE - 1954



PLATFORM RUNG DETAILS

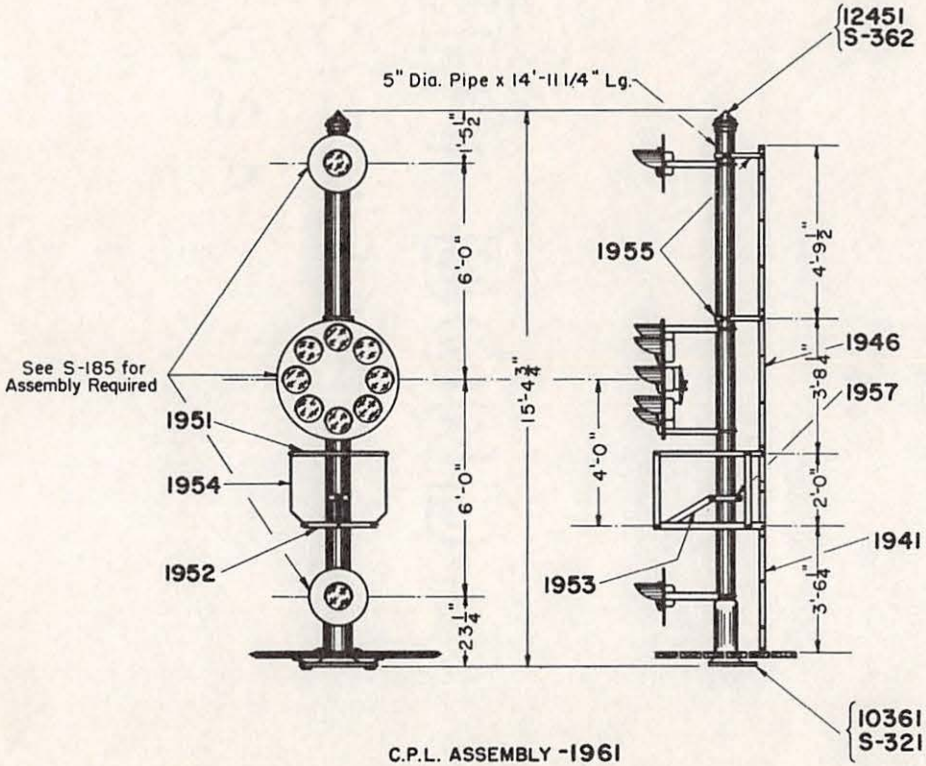
Approved: A. J. Hunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
LADDER STAYS, HANDRAIL, AND PLATFORM FOR COLOR POSITION LIGHT SIGNALS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Dec. 1, 1949

Sheet No. 1

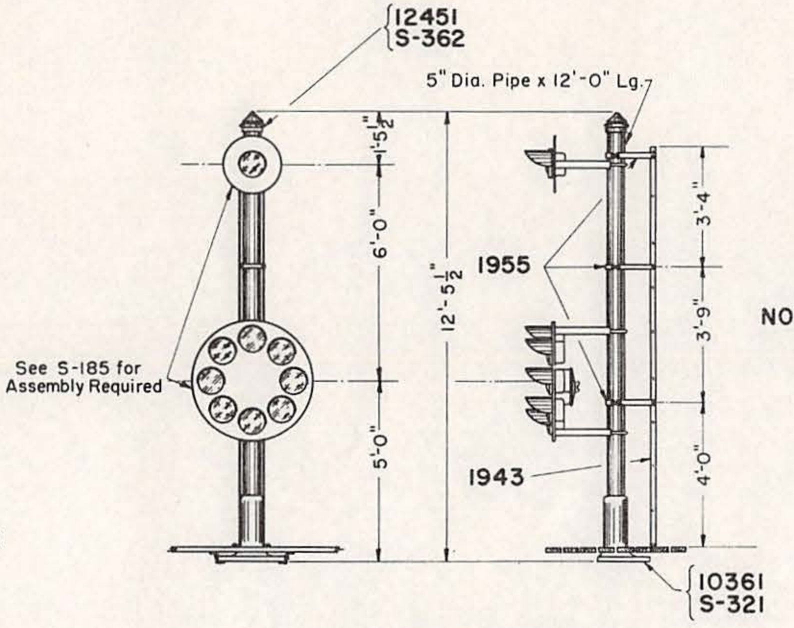
S-195

Adopted: 4-25-50.



12451
S-362
5" Dia. Pipe x 14'-11 1/4" Lg.
1'-5½"
6'-0"
15'-4¾"
6'-0"
2 3¼"
See S-185 for Assembly Required
1951
1954
1952
1955
4'-9½"
1946
3'-8¼"
1957
4'-0"
2'-0"
1941
1953
3'-6¼"
10361
S-321

C.P.L. ASSEMBLY -1961



12451
S-362
5" Dia. Pipe x 12'-0" Lg.
1'-5½"
6'-0"
12'-5½"
5'-0"
See S-185 for Assembly Required
1955
3'-4"
3'-9"
4'-0"
1943
10361
S-321

C.P.L. ASSEMBLY-1962

TYPICAL ORDERING REFERENCE

"__________ Color Position Light High Signal complete No.196_, Dwg.S-196, with assembly Fig. B-1-5, Dwg.S-185".

"__________ Color Position Light High Signal complete No.196_, Dwg.S-196, with assembly Fig. B-1-5 having 30 degree spreadlite lens, Dwg. S-185.

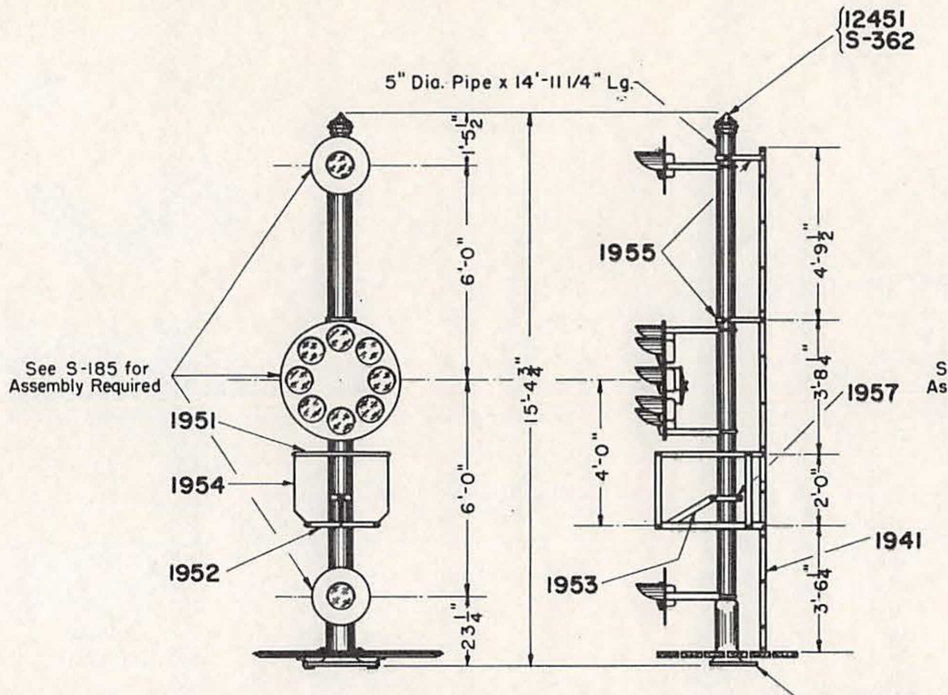
NOTES:

Painting shall be in accordance with Instructions I-134.

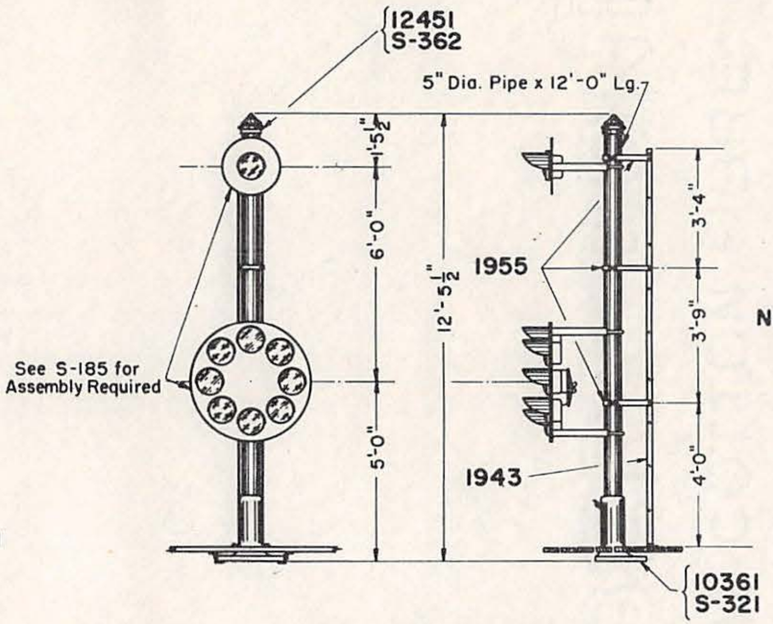
Approved: __________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
COLOR POSITION LIGHT SIGNALS FOR BRACKET POST OR CANTILEVER
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 30, 1949.

Adopted: 4-25-50.


12451
S-362
5" Dia. Pipe x 14'-11 1/4" Lg.
1'-5 1/2"
6'-0"
15'-4 3/4"
4'-9 1/2"
1955
See S-185 for Assembly Required
3'-8 1/4"
1957
4'-0"
1951
1954
6'-0"
2'-0"
1941
1952
1953
3'-6 1/4"
2'-3 1/4"
10361
S-321

C.P.L. ASSEMBLY -1961


12451
S-362
5" Dia. Pipe x 12'-0" Lg.
1'-5 1/2"
6'-0"
12'-5 1/2"
3'-4"
1955
3'-9"
See S-185 for Assembly Required
5'-0"
1943
4'-0"
10361
S-321

C.P.L. ASSEMBLY -1962

TYPICAL ORDERING REFERENCE

"________ Color Position Light High Signal complete No.196_, Dwg. S-196, with assembly Fig. B-1-5, Dwg. S-185".

"________ Color Position Light High Signal complete No.196_, Dwg. S-196, with assembly Fig. B-1-5 having 30 degree spreadlite lens, Dwg. S-185.

NOTES:

Painting shall be in accordance with Instructions I-134.

Approved: ________

Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

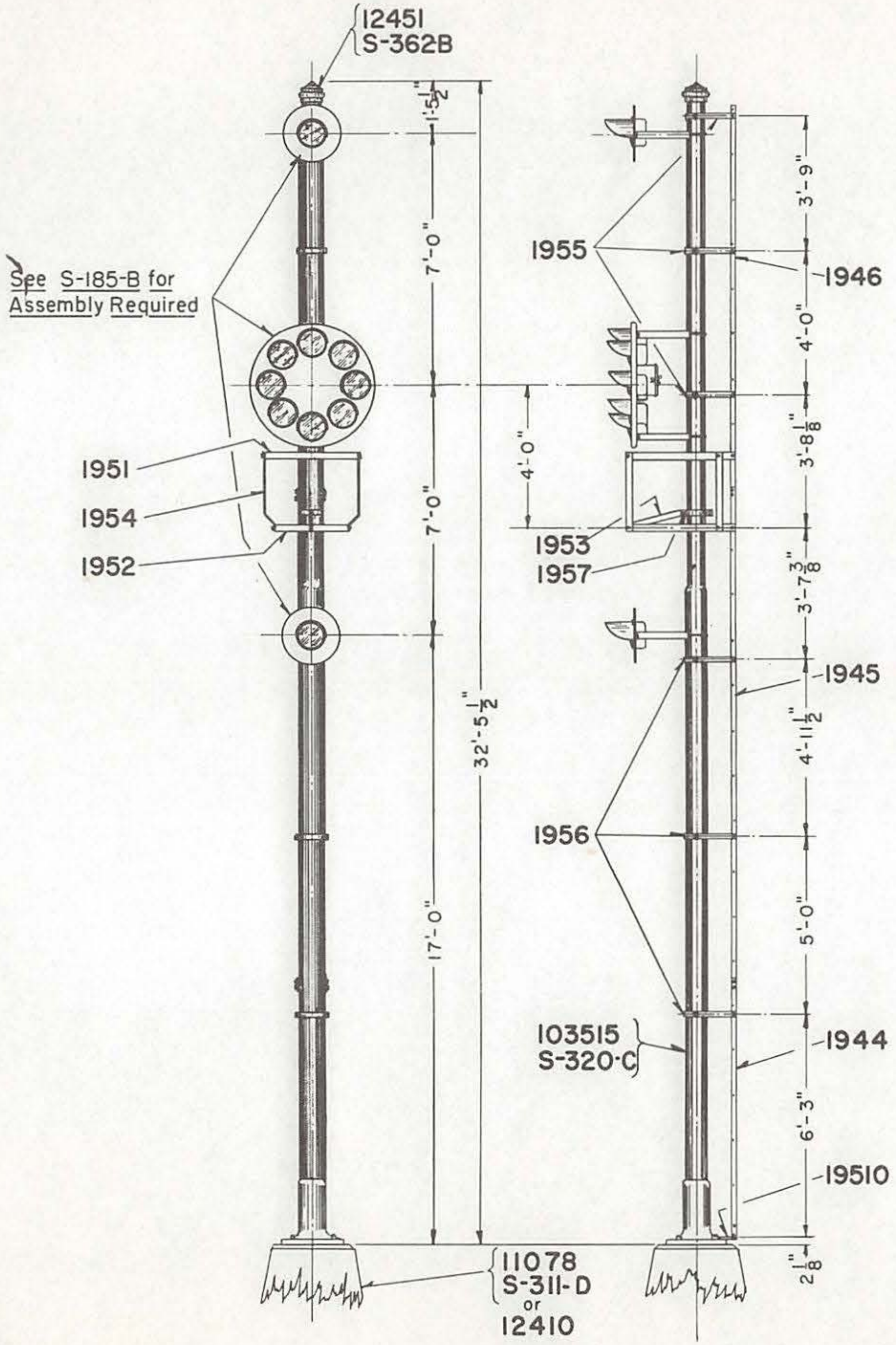
COLOR POSITION LIGHT SIGNALS FOR BRACKET POST OR CANTILEVER

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 30, 1949.

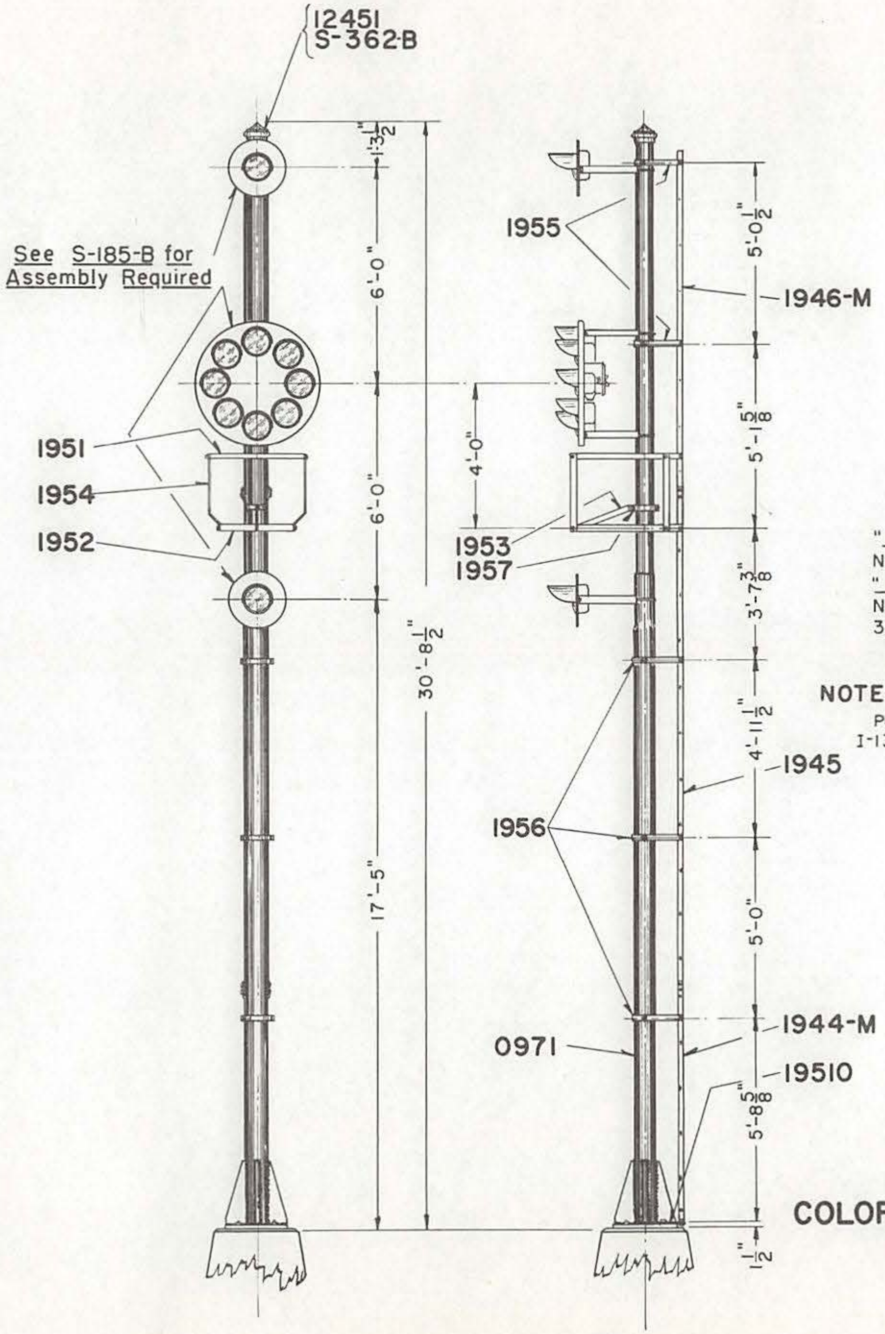
Sheet No. 1

S-196-A

Adopted: 4-25-50.
Revised: 10-3-50 Pc. No. 1946 removed.


12451
S-362B
1'-5 1/2"
See S-185-B for Assembly Required
1955
1946
3'-9"
7'-0"
4'-0"
4'-0"
3'-8 1/8"
1951
1954
1952
1953
1957
7'-0"
3'-7 3/8"
1945
4'-11 1/2"
32'-5 1/2"
1956
5'-0"
17'-0"
103515
S-320-C
1944
6'-3"
19510
2 1/8"
11078
S-311-D
or
12410

C.P.L. ASSEMBLY -1971


12451
S-362B
1'-3 1/2"
See S-185-B for Assembly Required
1955
6'-0"
5'-0 1/2"
1946-M
1951
1954
1952
4'-0"
5'-1 5/8"
6'-0"
1953
1957
3'-7 3/8"
30'-8 1/2"
4'-11 1/2"
1945
1956
17'-5"
5'-0"
1944-M
0971
19510
5'-8 5/8"
1 1/2"

C.P.L. ASSEMBLY -1971-M

TYPICAL ORDERING REFERENCE

"________Color Position Light high signal complete No. 197_, Dwg. S-197-B, with assembly Fig. B-1-5, Dwg. S-185-B"

"________Color Position Light high signal complete No. 197_, Dwg. S-197-B, with assembly Fig. B-1-5 having 30 degree spreadlite lens, Dwg. S-185-B.

NOTES:

Painting shall be in accordance with current instructions I-134.

Approved: A L Jordan
Signal Engineer

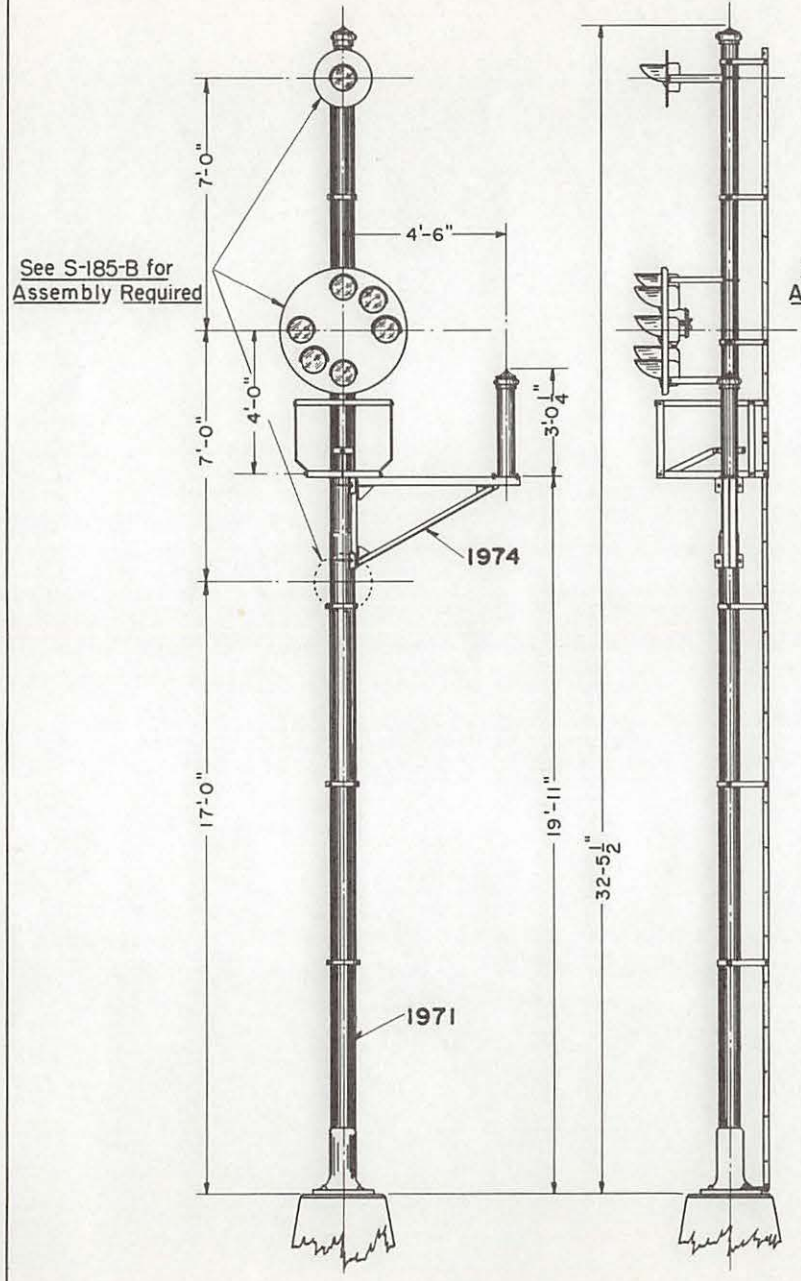
BALTIMORE & OHIO RAILROAD

COLOR POSITION LIGHT GROUND SIGNALS

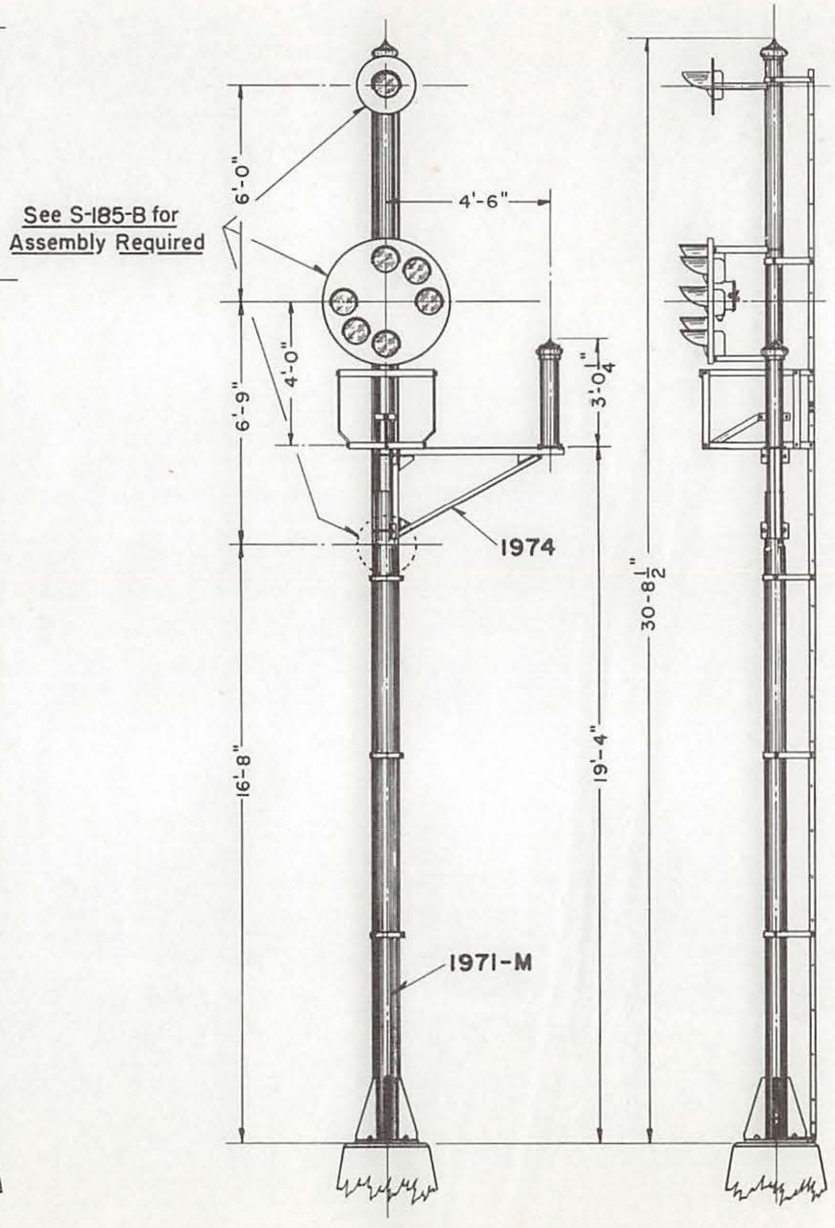
Office of Signal Engineer
Baltimore, Md.
March 1, 1962

Sheet No. 1

S-197-B


7'-0"
4'-6"
See S-185-B for Assembly Required
4'-0"
7'-0"
3'-0 1/4"
1974
17'-0"
19'-11"
32'-5 1/2"
1971

C.P.L. ASSEMBLY WITH
CANTILEVER BRACKET –1971-BR


6'-0"
4'-6"
See S-185-B for Assembly Required
4'-0"
6'-9"
3'-0 1/4"
1974
16'-8"
19'-4"
30'-8 1/2"
1971-M

C.P.L. ASSEMBLY WITH
CANTILEVER BRACKET –1971-MBR

TYPICAL ORDERING REFERENCE

"__________Color Position Light high signal complete No.197_, Dwg. S-197-D, with assembly Fig. B-1-5, Dwg. S-185-B."

"__________Color Position Light high signal complete No.197_, Dwg. S-197-D, with assembly Fig. B-1-5 having 30 degree spreadlite lens, Dwg. S-185-B.

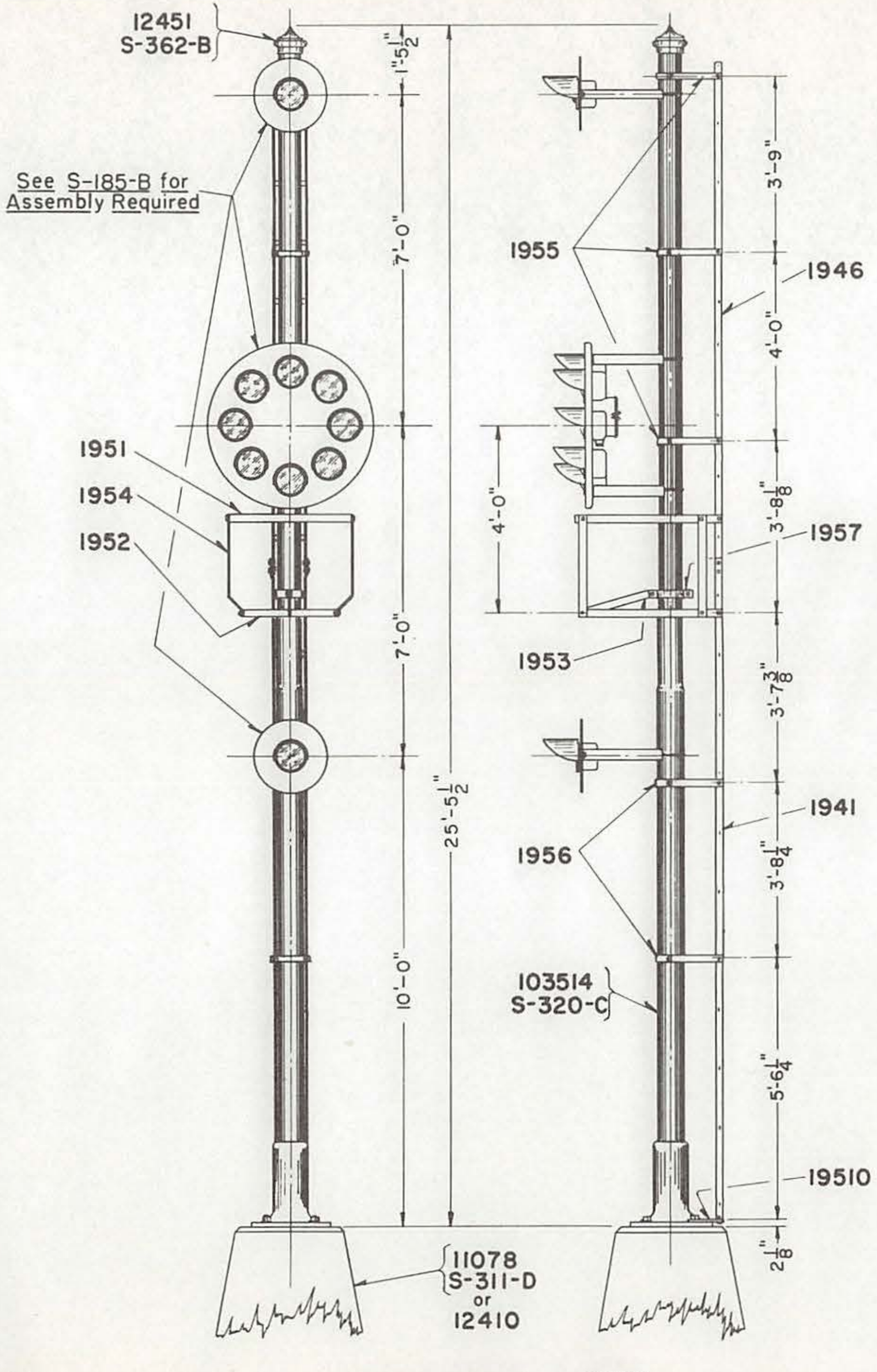
NOTES:

Painting shall be in accordance with current instructions I-134.

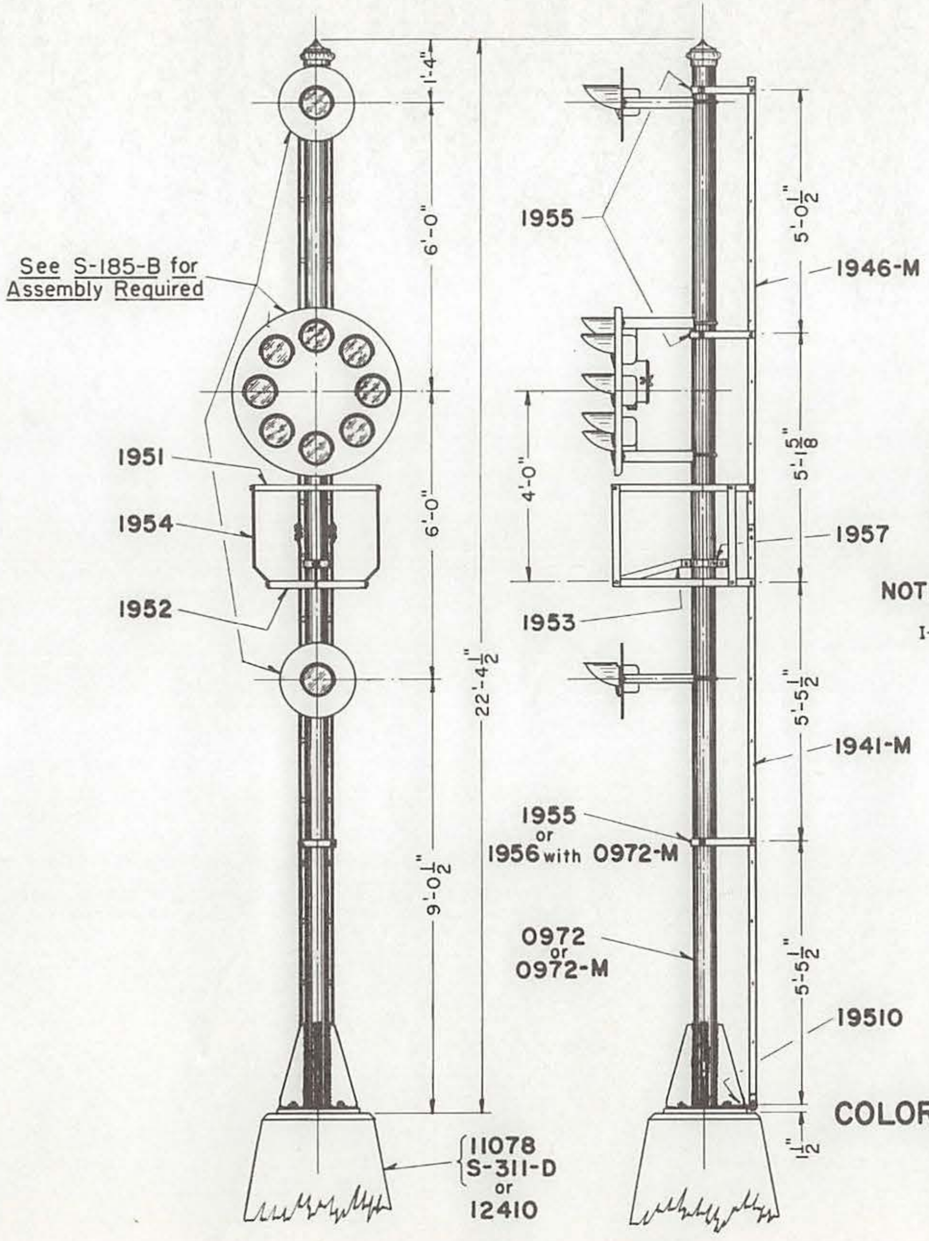
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
COLOR POSITION LIGHT GROUND SIGNALS
Office of Signal Engineer
Baltimore, Md.
March 1, 1962

Sheet No. 2
S-197-B


12451
S-362-B
1'-5½"
See S-185-B for Assembly Required
7'-0"
1955
3'-9"
1946
4'-0"
1951
1954
1952
4'-0"
3'-8⅛"
1957
7'-0"
1953
3'-7⅜"
25'-5½"
1941
1956
3'-8¼"
10'-0"
103514
S-320-C
5'-6¼"
19510
2⅛"
11078
S-311-D
or
12410

C.P.L. ASSEMBLY - **1972**


1'-4"
6'-0"
1955
5'-0½"
1946-M
See S-185-B for Assembly Required
1951
4'-0"
5'-1⅝"
1954
6'-0"
1957
1952
1953
22'-4½"
5'-5½"
1941-M
1955
or
1956 with 0972-M
9'-0½"
0972
or
0972-M
5'-5½"
19510
1½"
11078
S-311-D
or
12410

C.P.L. ASSEMBLY - **1972-M**

TYPICAL ORDERING REFERENCE

"__________ Color Position Light high signal complete No.197_, Dwg. S-197-D, with assembly Fig. B-1-5, Dwg. S-185-B.

"__________ Color Position Light high signal complete No.197_, Dwg. S-197-D, with assembly Fig. B-1-5 having 30 degree spreadlite lens, Dwg. S-185-B.

NOTES:

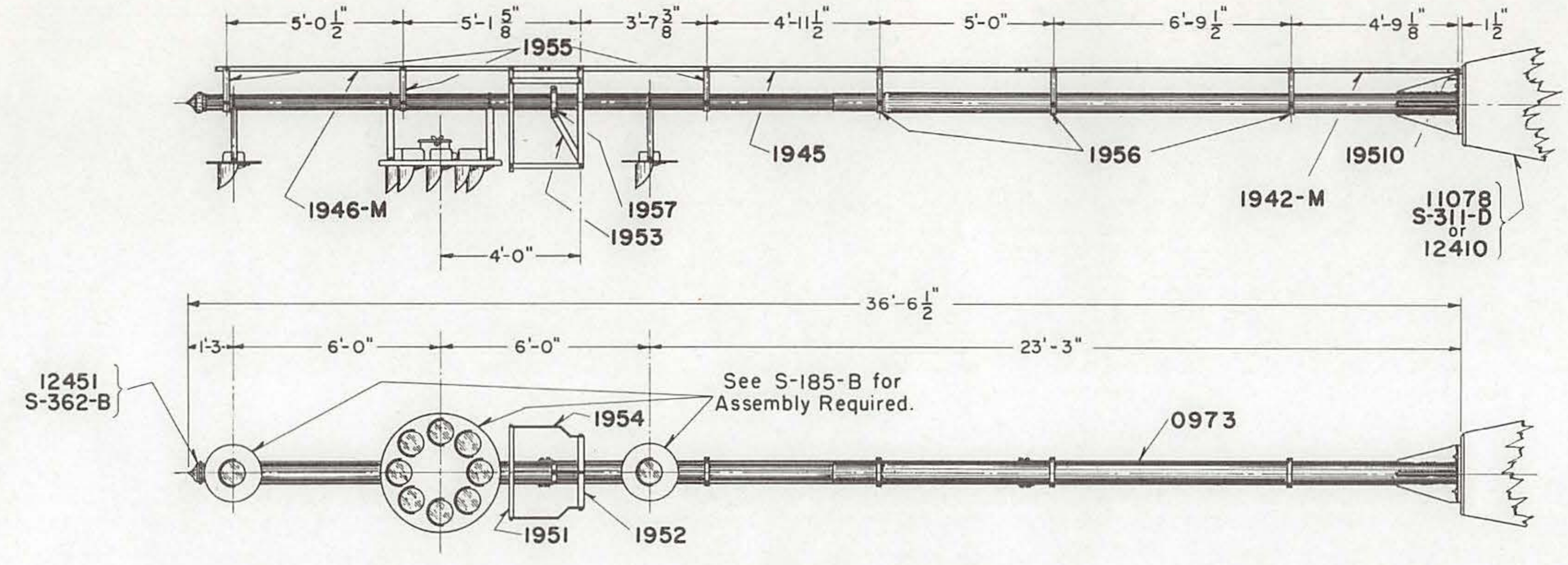
Painting shall be in accordance with current instructions I-134.

Approved: A. L. Jordan
Signal Engineer

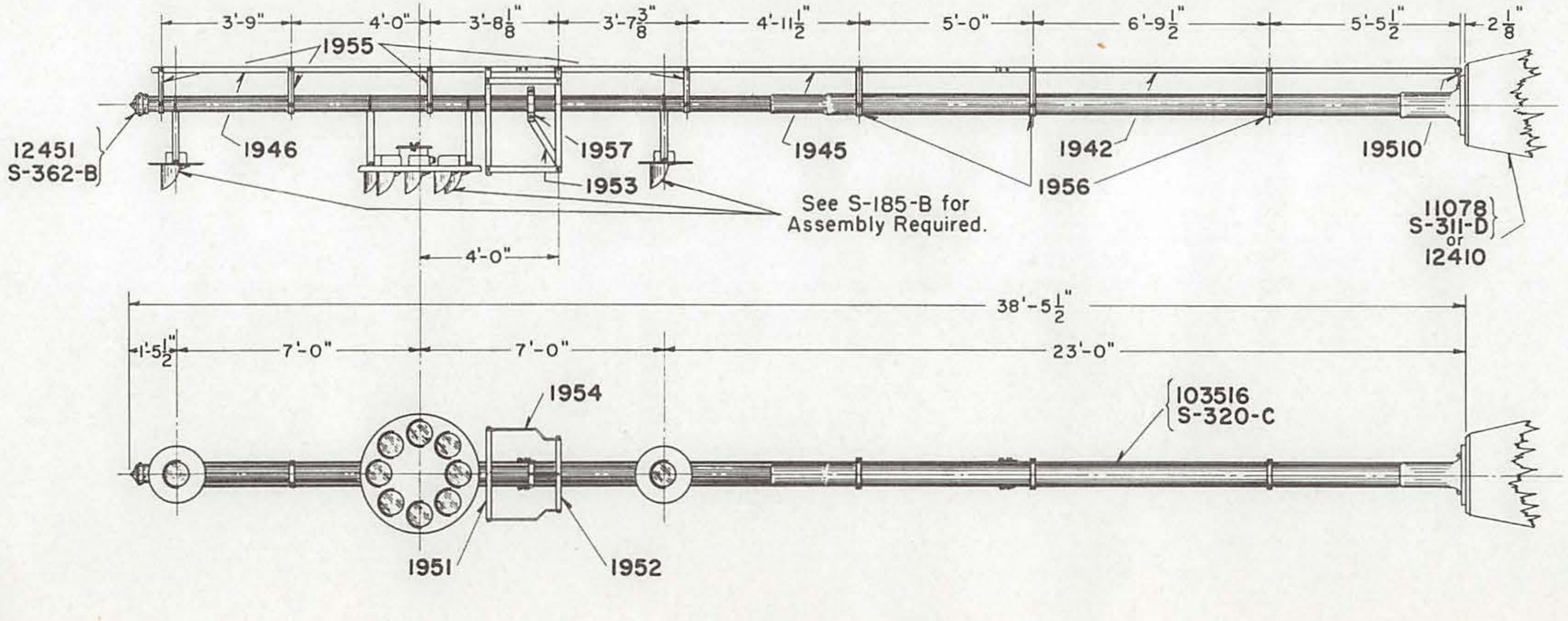
BALTIMORE & OHIO RAILROAD
COLOR POSITION LIGHT GROUND SIGNALS
Office of Signal Engineer
Baltimore, Md.
March 1, 1962

Sheet No. 3

S-197-B


5'-0 1/2"
5'-1 5/8"
3'-7 3/8"
4'-11 1/2"
5'-0"
6'-9 1/2"
4'-9 1/8"
1 1/2"
1955
1945
1956
19510
1946-M
1957
1953
1942-M
11078
S-311-D
or
12410
4'-0"
36'-6 1/2"
1'-3
6'-0"
6'-0"
23'-3"
12451
S-362-B
See S-185-B for
Assembly Required.
1954
0973
1951
1952

C.P.L. ASSEMBLY — **1973-M**


3'-9"
4'-0"
3'-8 1/8"
3'-7 3/8"
4'-11 1/2"
5'-0"
6'-9 1/2"
5'-5 1/2"
2 1/8"
1955
12451
S-362-B
1946
1957
1945
1942
19510
1953
1956
See S-185-B for
Assembly Required.
11078
S-311-D
or
12410
4'-0"
38'-5 1/2"
1'-5 1/2"
7'-0"
7'-0"
23'-0"
1954
103516
S-320-C
1951
1952

C.P.L. ASSEMBLY — **1973**

TYPICAL ORDERING REFERENCE

"________ Color Position Light high signal complete No.197_, Dwg.S-197-D, with assembly Fig.B-I-5, Dwg.S-185-B."

"________ Color Position Light high signal complete No.197_, Dwg.S-197-D, with assembly Fig. B-I-5, having 30 degree spreadlite lens, Dwg. S-185-B.

NOTES:

Painting shall be in accordance with current instructions I-134.

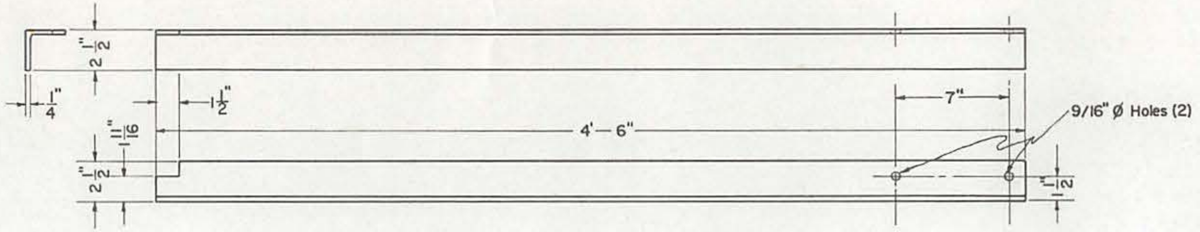
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

COLOR POSITION LIGHT GROUND SIGNALS

Office of Signal Engineer
Baltimore, Md.
March 1, 1962

Sheet No. 4 S-197-B


2 1/2"
1/4"
1 1/2"
11/16"
4'—6"
7"
9/16" Ø Holes (2)
2 1/2"
1 1/2"

1- 2-1/2" x 2-1/2" x 1/4" x 4'-6" L as shown **-1974-1**
1- " " " " " opposite hand **-1974-2**

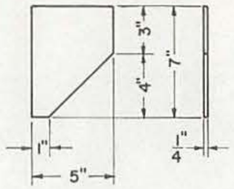


PLATE-1974-8
(1 Req'd.)

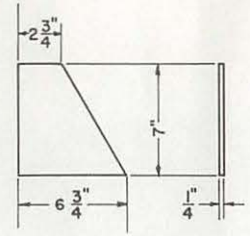


PLATE-1974-9
(1 Req'd.)

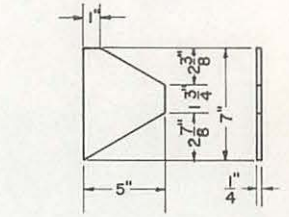
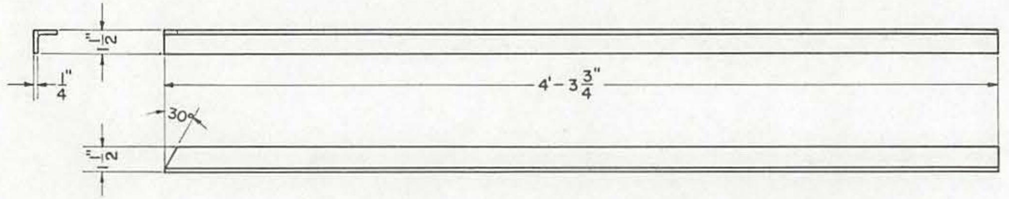
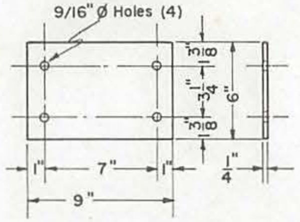

1"
2 3/8"
1 3/4"
2 7/8"
7"
5"
1/4"

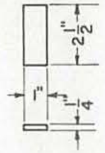
PLATE-1974-10
(1 Req'd.)


1 1/2"
1/4"
4'-3 3/4"
30°
1 1/2"

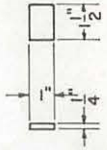
1- 1-1/2" x 1-1/2" x 1/4" x 4'-3-3/4" L as shown **-1974-3**
1- " " " " " opposite hand **-1974-4**


9/16" Ø Holes (4)
1 3/8"
3 1/4"
1 3/8"
6"
1"
7"
1"
9"
1/4"

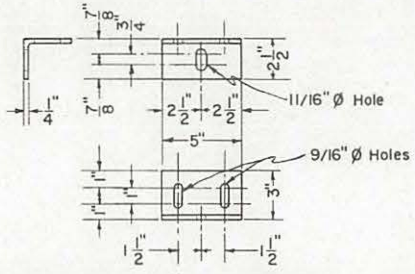
BASE PLATE-1974-11
(1 Req'd.)



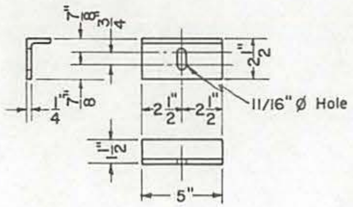
FILLER PLATE-1974-12
(2 Req'd.)



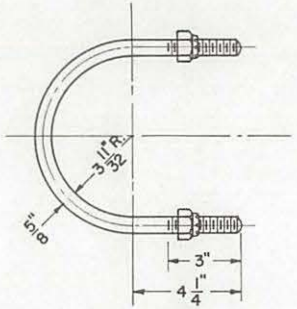
FILLER PLATE-1974-13
(2 Req'd.)


7/8"
3/4"
2 1/2"
1/4"
7/8"
2 1/2"
2 1/2"
5"
11/16" Ø Hole
9/16" Ø Holes
1"
3"
1 1/2"
1 1/2"

3" x 2-1/2" x 1/4 x 5" L as shown **-1974-5**
(2 Req'd.)

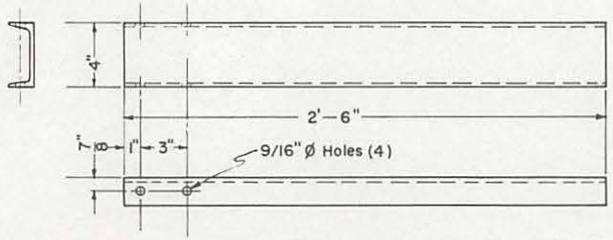

7/8"
3/4"
2 1/2"
1/4"
7/8"
2 1/2"
2 1/2"
11/16" Ø Hole
1 1/2"
5"

2-1/2" x 1-1/2" x 1/4" x 5" L as shown **-1974-6**
(2 Req'd.)

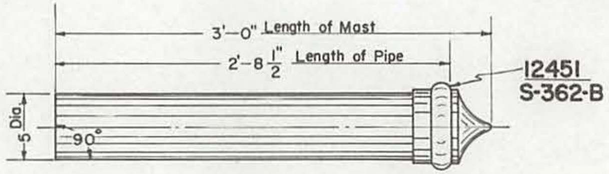

3 11/32" R.
5/8"
3"
4 1/4"

"U" BOLT-**1974-14**
(2 Req'd.)

4- 5/8 Dia. Std. Flat Washers
8- 1/2" x 1-1/2" Sq. Hd. Machine Bolts with Flat Washers & ESNA Stop Nuts, ESNA Part No. 29NE-083.
4- 5/8"-11 Elastic Stop Nuts, ESNA Part No. 29NE-101.


4"
2'—6"
7/8"
1"
3"
9/16" Ø Holes (4)

4" x 6.25# x 2'-6" ⊏ **-1974-7**
(1 Req'd.)


3'—0" Length of Mast
2'-8 1/2" Length of Pipe
12451
S-362-B
5 Dia.
90°

DOLL MAST **-1974-14**
(1 Req'd.)

BALTIMORE & OHIO RAILROAD

CANTILEVER BRACKET
FOR COLOR POSITION LIGHT GROUND SIGNAL

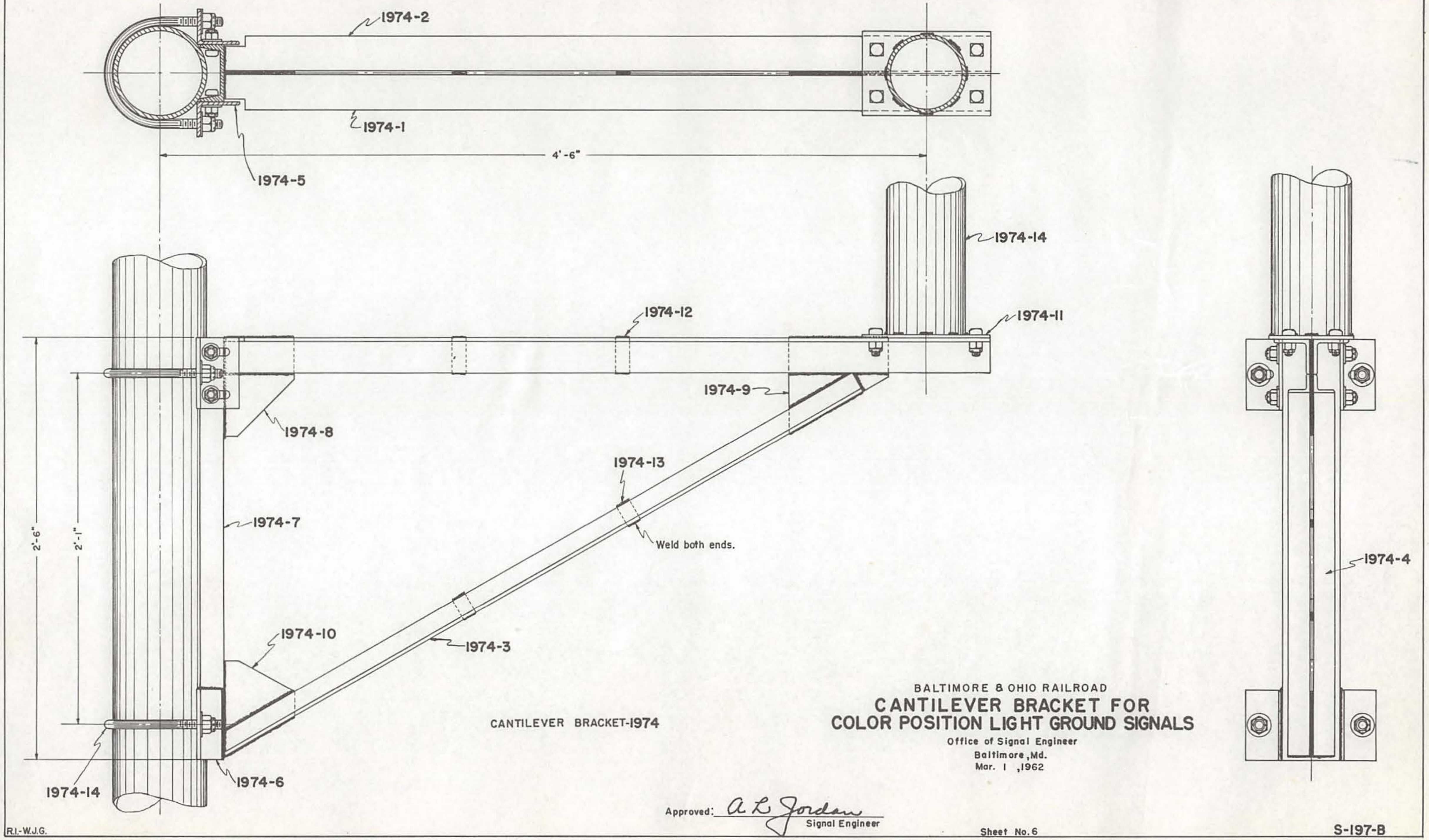
Office of Signal Engineer
Baltimore, Md.
Mar. 1, 1962

Approved: A L Jordan
Signal Engineer

R.I.-W.J.G.

Sheet No. 5

S-197-B


1974-2
1974-1
1974-5
4'-6"
1974-14
1974-12
1974-11
1974-9
1974-8
1974-13
1974-7
Weld both ends.
1974-4
2'-6"
2'-1"
1974-10
1974-3
1974-14
1974-6
CANTILEVER BRACKET-1974

BALTIMORE & OHIO RAILROAD

CANTILEVER BRACKET FOR COLOR POSITION LIGHT GROUND SIGNALS

Office of Signal Engineer
Baltimore, Md.
Mar. 1, 1962

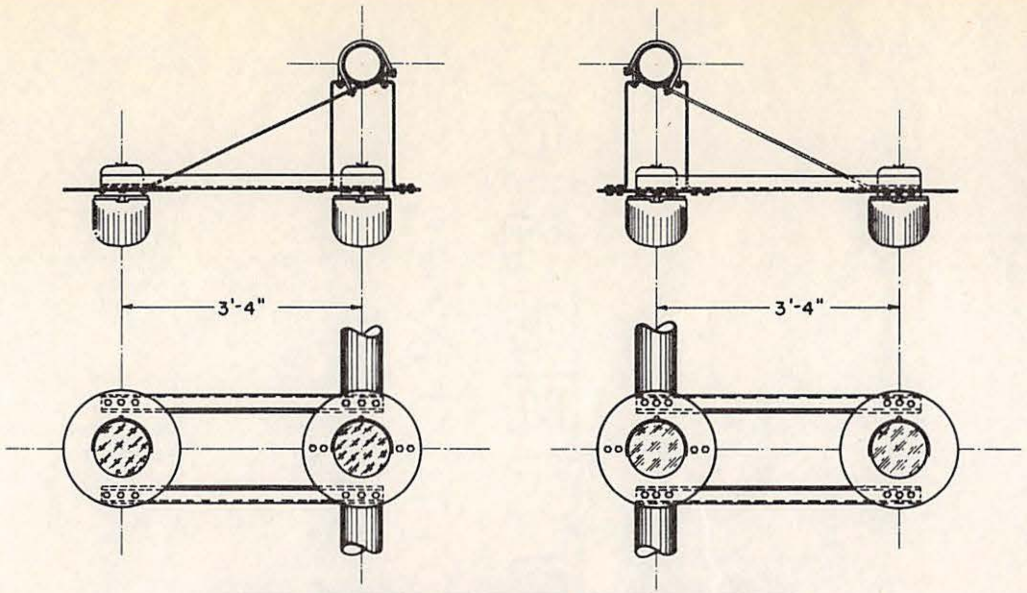
Approved: A L Jordan
Signal Engineer

Adopted: 1-10-61

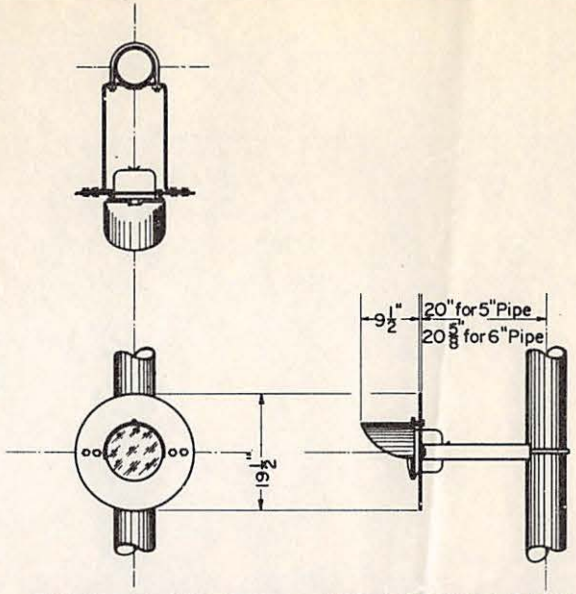
R.I.-W.J.G.

Sheet No. 6

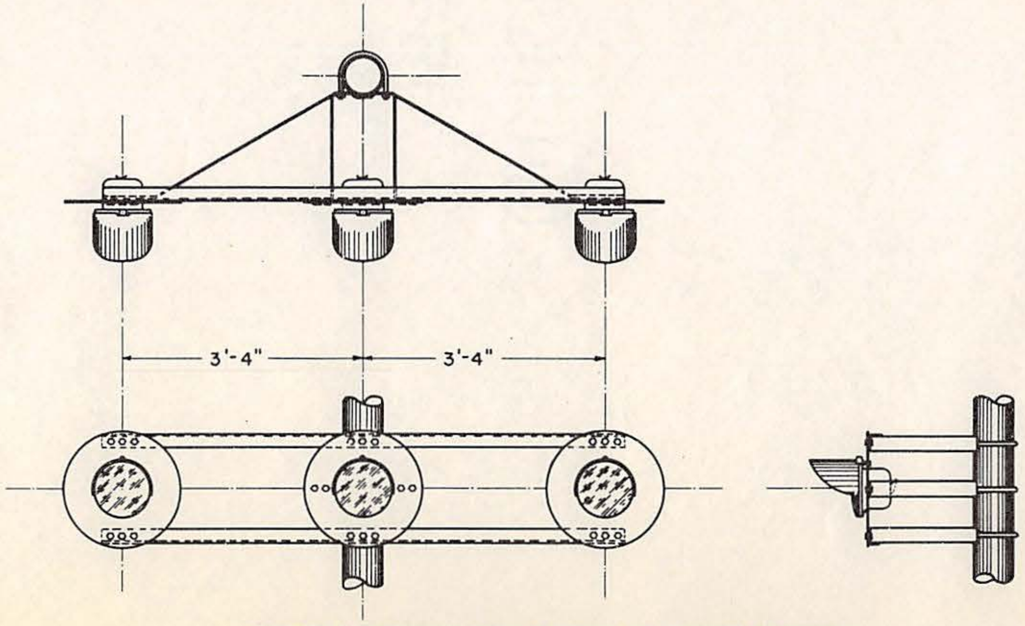
S-197-B



SKETCH SHOWING APPLICATION OF TWO MARKERS
(Top or Bottom)



SKETCH SHOWING APPLICATION OF SINGLE MARKER
(Top or Bottom)



SKETCH SHOWING APPLICATION OF THREE MARKERS
(Top or Bottom)

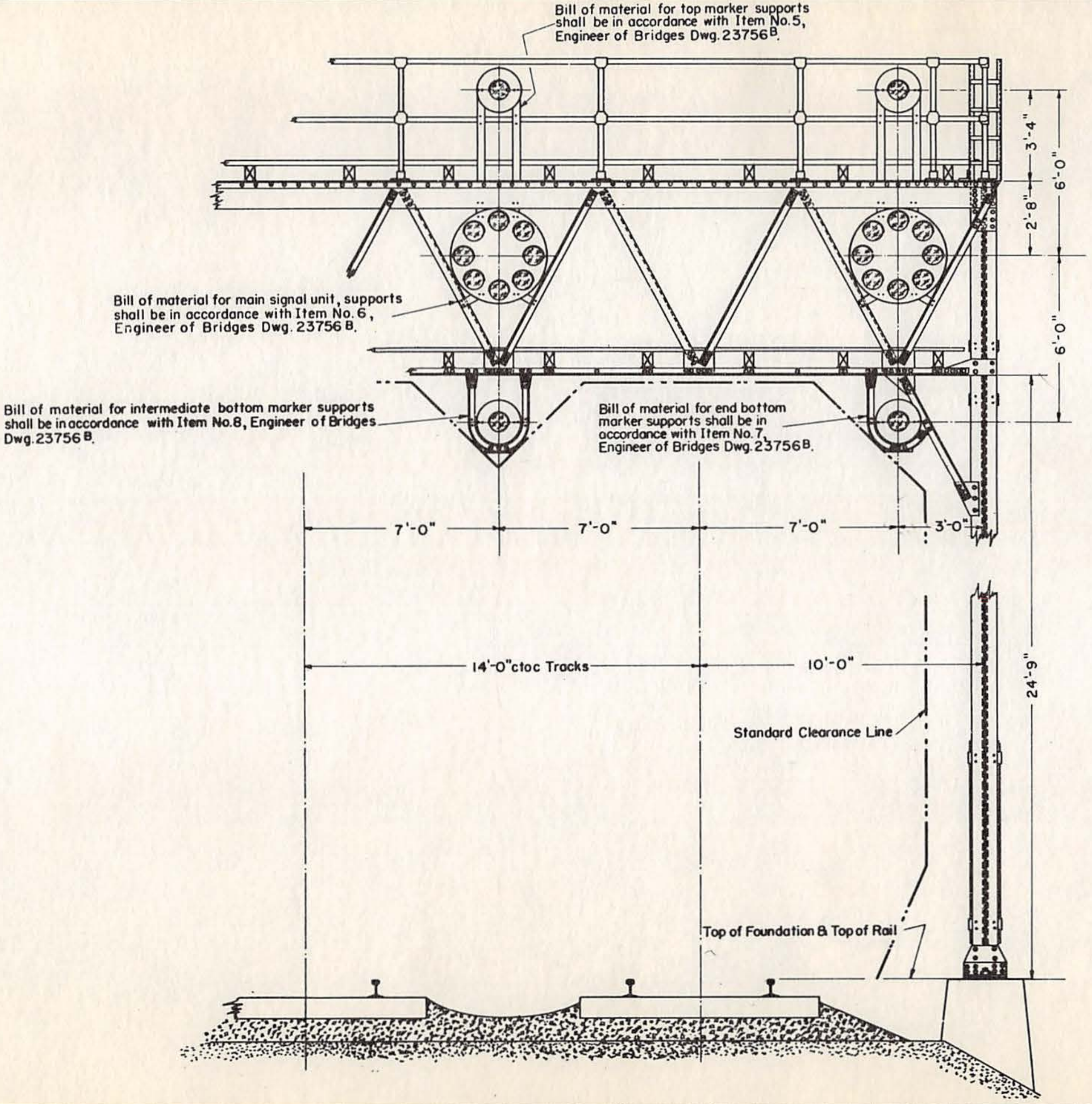
Approved:
Chief Eng'r. Comm. & Sigs.

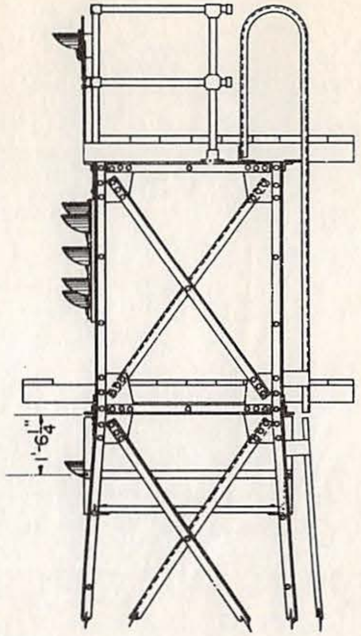
BALTIMORE & OHIO RAILROAD
MARKER LIGHTS FOR COLOR POSITION LIGHT SIGNALS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 30, 1949

Sheet No. 1

S-198

Adopted 4-25-50.


Bill of material for top marker supports shall be in accordance with Item No.5, Engineer of Bridges Dwg. 23756B.
Bill of material for main signal unit, supports shall be in accordance with Item No. 6, Engineer of Bridges Dwg. 23756 B.
Bill of material for intermediate bottom marker supports shall be in accordance with Item No.8, Engineer of Bridges Dwg. 23756 B.
Bill of material for end bottom marker supports shall be in accordance with Item No. 7, Engineer of Bridges Dwg. 23756B.
3'-4"
2'-8"
6'-0"
6'-0"
6'-0"
7'-0"
7'-0"
7'-0"
3'-0"
24'-9"
14'-0" ctoc Tracks
10'-0"
Standard Clearance Line
Top of Foundation & Top of Rail



NOTES:

Where top stagger marker is used shift one support as necessary and drill holes for connections in field. Shift railing post as necessary.

Painting shall be in accordance with Instructions for Painting Signal & Interlocking Apparatus I-134.

Bridge construction shall be in accordance with Office of Engineer of Bridges Drawing No. 23258- .

See standard plan S-185 for signal assemblies required.

Approved: A.H. Hunt
Chief Eng'r. Comm. & Sigs.

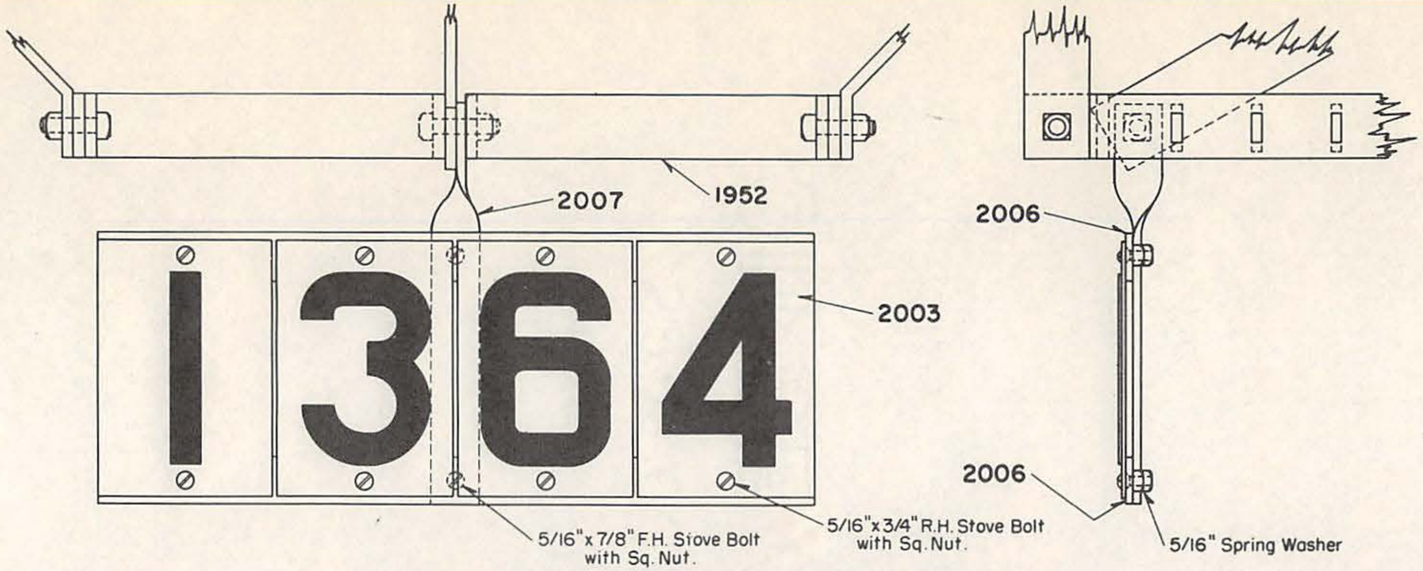
BALTIMORE & OHIO RAILROAD

COLOR POSITION LIGHT SIGNALS FOR SIGNAL BRIDGES

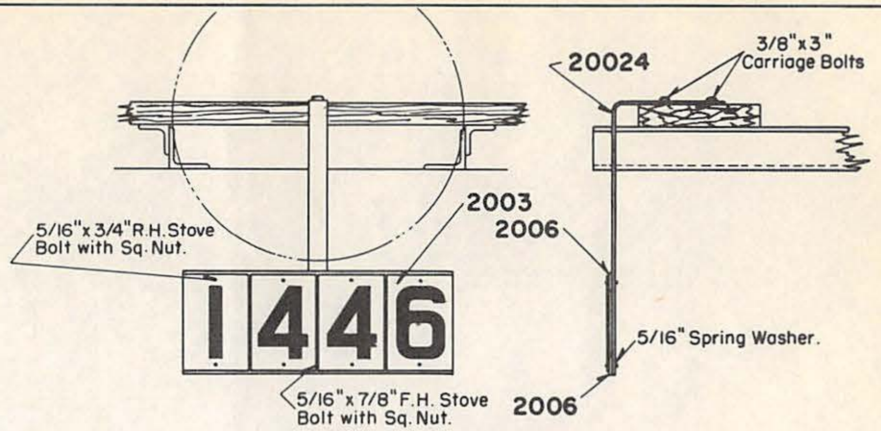
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 4, 1950

S-199

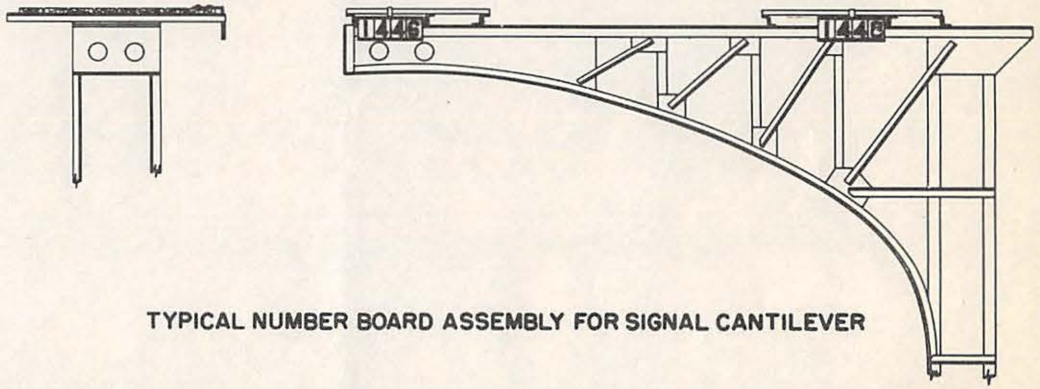
Adopted: 4-25-50.


2007
1952
2003
1364
5/16"x 7/8" F.H. Stove Bolt with Sq. Nut.
5/16"x 3/4" R.H. Stove Bolt with Sq. Nut.
2006
2006
5/16" Spring Washer

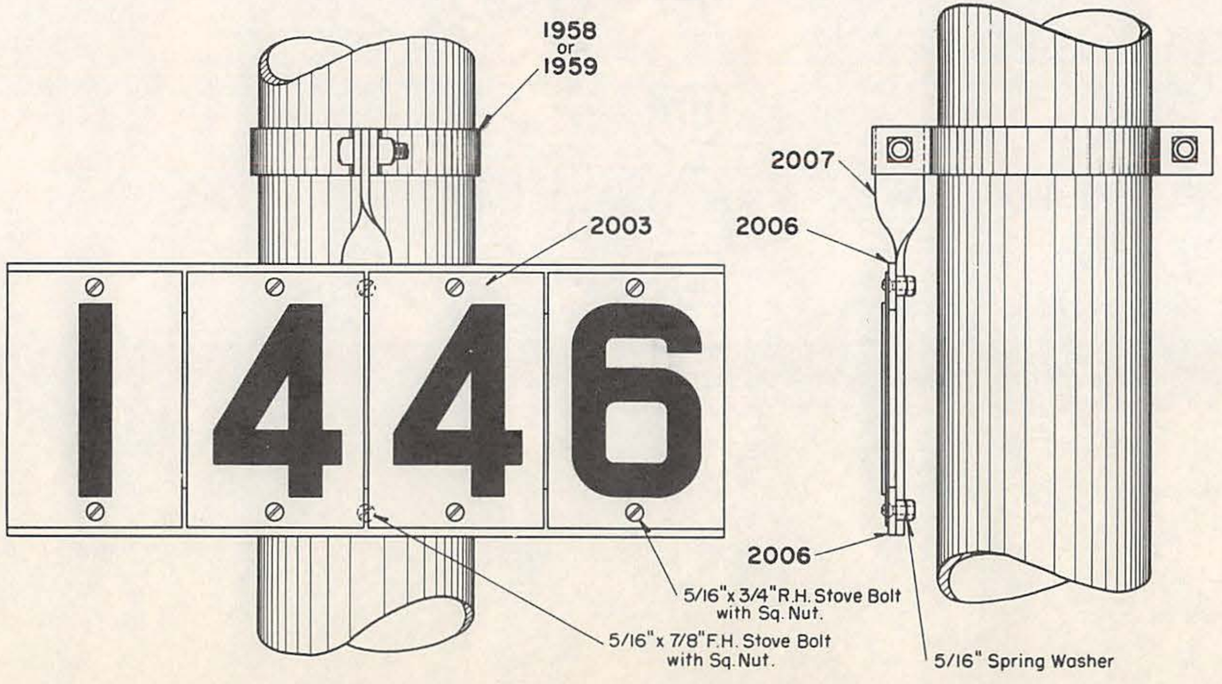
TYPICAL NUMBER BOARD ASSEMBLY FOR C.P.L. SIGNAL
(NO. 20010 SHOWN)


20024
3/8"x3" Carriage Bolts
5/16"x 3/4" R.H. Stove Bolt with Sq. Nut.
2003
2006
1446
5/16" Spring Washer.
5/16"x 7/8" F.H. Stove Bolt with Sq. Nut.
2006

ENLARGED VIEW SHOWING
APPLICATION WHEN PERMISSIVE MARKER IS USED
(NO. 20022 SHOWN)



TYPICAL NUMBER BOARD ASSEMBLY FOR SIGNAL CANTILEVER


1958
or
1959
2007
2003
2006
1446
2006
5/16"x 3/4" R.H. Stove Bolt with Sq. Nut.
5/16"x 7/8" F.H. Stove Bolt with Sq. Nut.
5/16" Spring Washer

TYPICAL NUMBER BOARD ASSEMBLY FOR SEMAPHORE SIGNALS

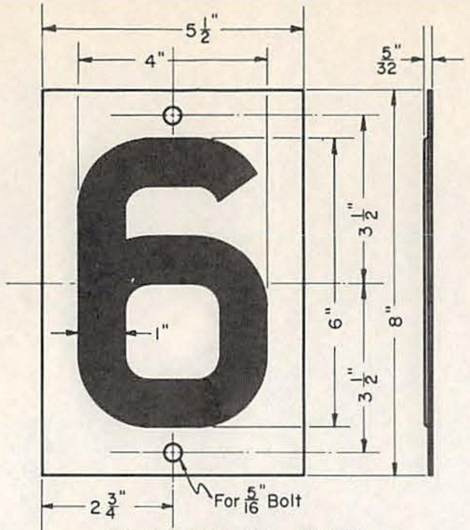
Approved: ______
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
SIGNAL NUMBER BOARDS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
March 1, 1951.

Sheet No. 1

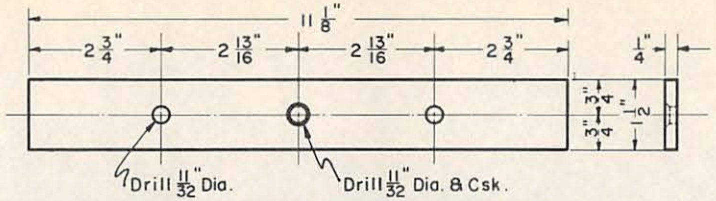
S-200-A

Adopted: 4-26-50.
New plan made account Signal
& Cantilever Vert. Supports sho -16-51.



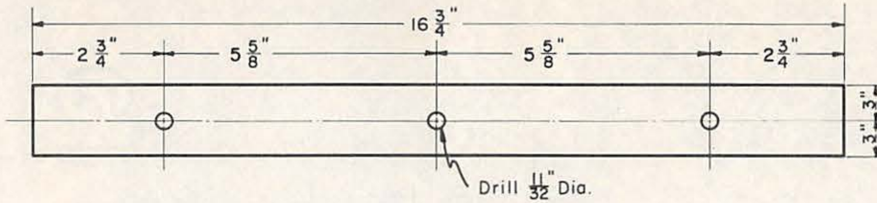
5 1/2"
4"
5/32"
3 1/2"
6"
8"
3 1/2"
1"
2 3/4"
For 5/16" Bolt

TYPICAL NUMERAL -2003



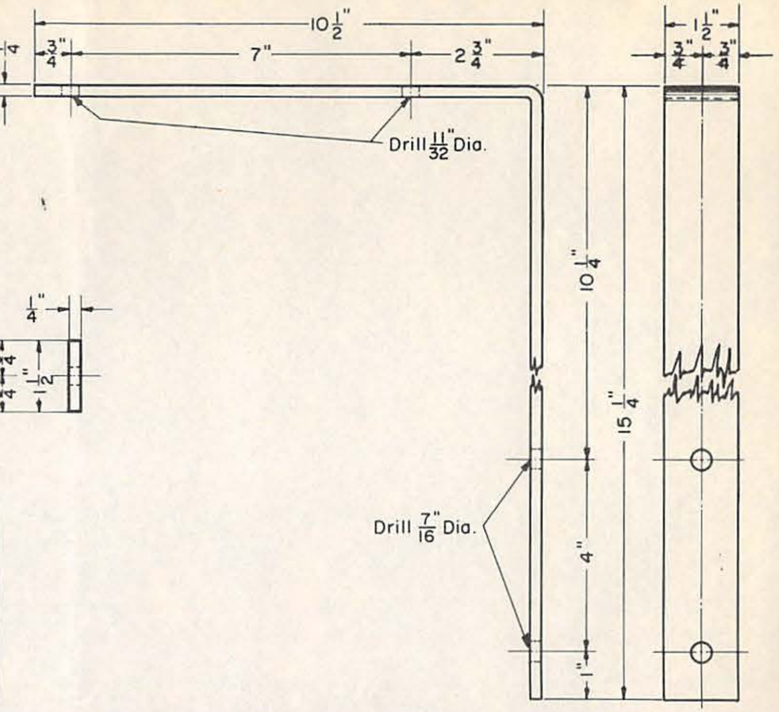
11 1/8"
2 3/4"
2 13/16"
2 13/16"
2 3/4"
1/4"
3/4"
3/4"
1 1/2"
Drill 11/32" Dia.
Drill 11/32" Dia. & Csk.

HORIZONTAL SUPPORT FOR 2 NUMBERS -2004



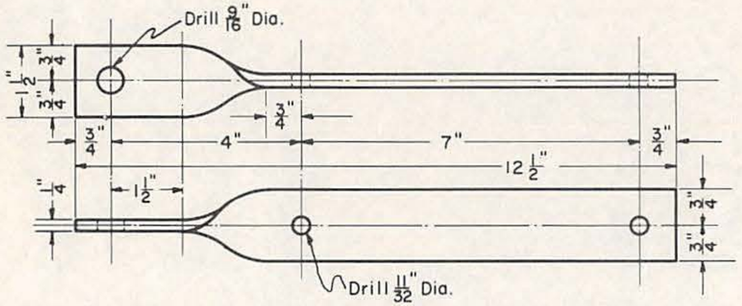
16 3/4"
2 3/4"
5 5/8"
5 5/8"
2 3/4"
1/4"
3/4"
3/4"
1 1/2"
Drill 11/32" Dia.

HORIZONTAL SUPPORT FOR 3 NUMBERS 2005



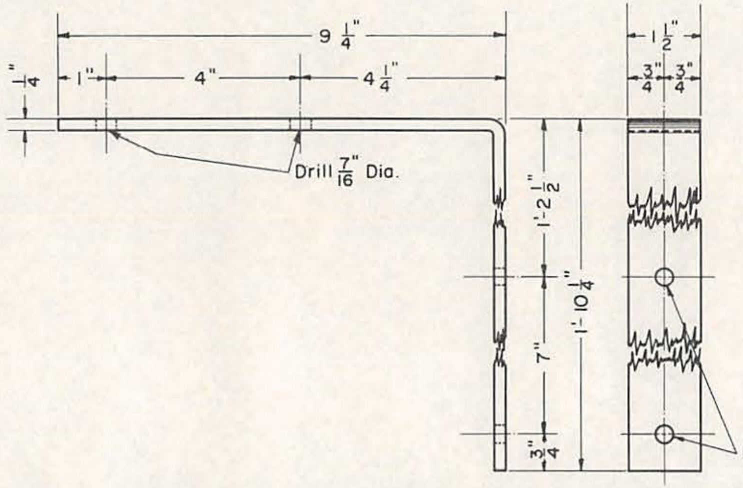
10 1/2"
1/4"
3/4"
7"
2 3/4"
1 1/2"
3/4"
3/4"
Drill 11/32" Dia.
10 1/4"
15 1/4"
4"
1"
Drill 7/16" Dia.

VERTICAL SUPPORT FOR HORIZONTAL NUMBERS
ON SIGNAL BRIDGE-BRACKET POST-CANTILEVER SIGNALS -20023



Drill 9/16" Dia.
3/4"
3/4"
1 1/2"
3/4"
3/4"
4"
7"
3/4"
12 1/2"
1/4"
1 1/2"
3/4"
3/4"
Drill 11/32" Dia.

VERTICAL SUPPORT FOR HORIZONTAL NUMBERS -2007



9 1/4"
1/4"
1"
4"
4 1/4"
1 1/2"
3/4"
3/4"
Drill 7/16" Dia.
1'-2 1/2"
1'-10 1/4"
7"
3/4"
Drill 11/32" Dia.

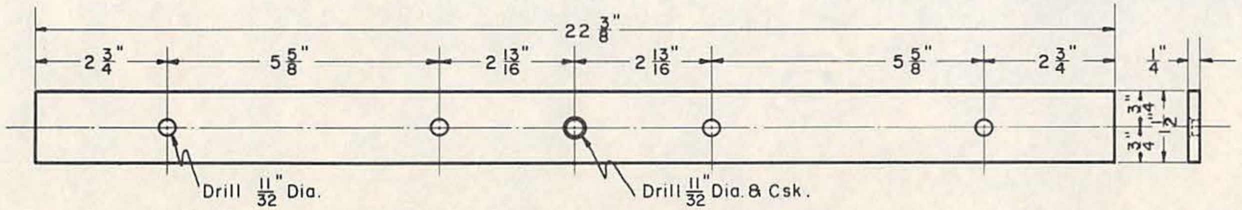
VERTICAL SUPPORT FOR HORIZONTAL NUMBERS ON CANTILEVER AND BRACKET SIGNALS
WHERE PERMISSIVE MARKER IS USED-20024

Note:

Numerals to be No. 16 ga. O.H. Steel pressed up and enameled with 3 coats of Vitreous Enamel.

Numerals to be white on black background.

Supports to be C-1020 steel.



22 3/8"
2 3/4"
5 5/8"
2 13/16"
2 13/16"
5 5/8"
2 3/4"
1/4"
3/4"
3/4"
1 1/2"
Drill 11/32" Dia.
Drill 11/32" Dia. & Csk.

HORIZONTAL SUPPORT FOR 4 NUMBERS -2006

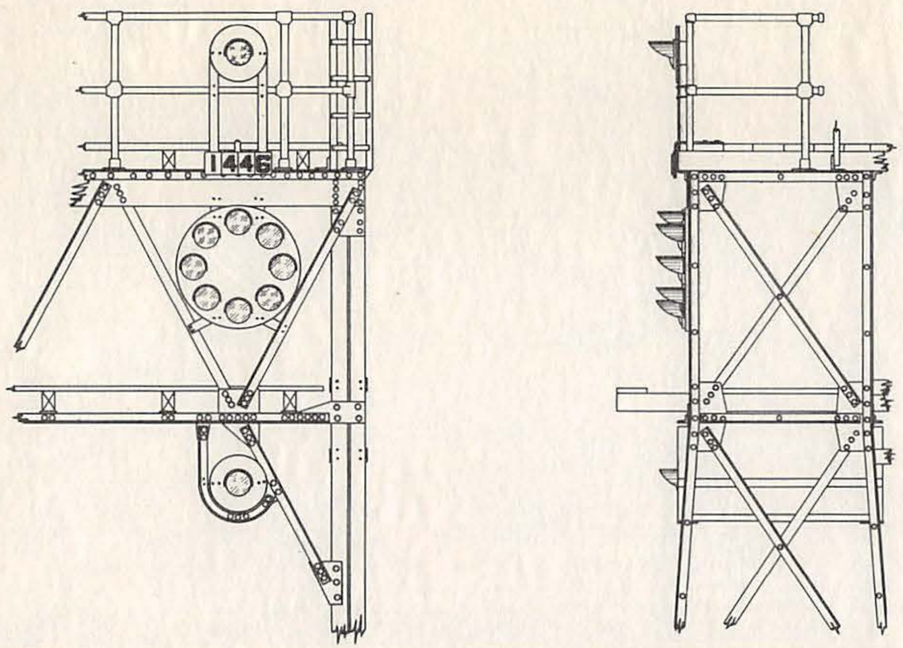
Approved:
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
SIGNAL NUMBER BOARDS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Feb. 1, 1950

Sheet No. 2
S-200-A

Adopted 4-26-50.
Revised 5-16-51 Account Sign ge &
Cantilever Vert. Supports sho

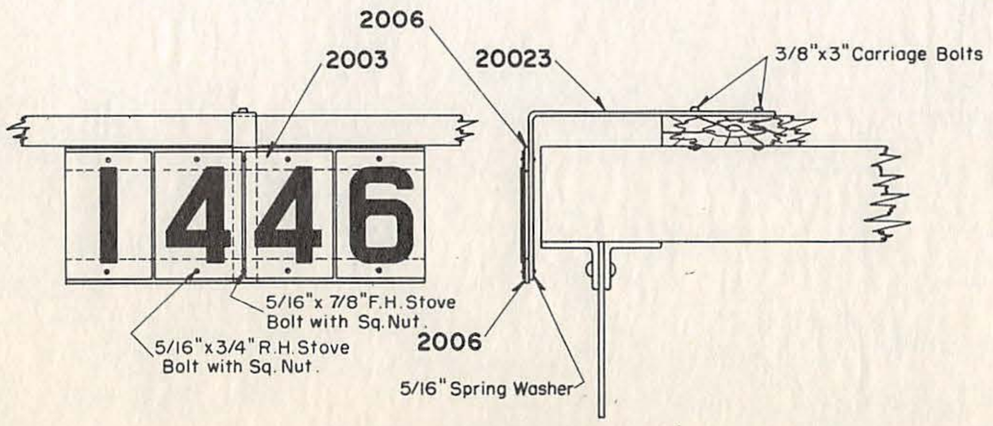
SPECIFICATION DEPT.
JUN 14 [illegible]



TYPICAL NUMBER BOARD ASSEMBLY FOR SIGNAL BRIDGES

PIECE NUMBER	NUMBER BOARD ASSEMBLIES														
	FOR C.P.L. SIGNALS			FOR SEMAPHORE SIGNALS						FOR SIGNAL BRIDGE BRACKET POST CANTILEVER SIGNALS			FOR BRACKET POST CANTILEVER SIGNAL Where Permissive Marker is used.		
				FOR 5" I.D. MAST			FOR 6" I.D. MAST								
	No. 2008 2 Numbers	No. 2009 3 Numbers	No. 20010 4 Numbers	No. 20011 2 Numbers	No. 20012 3 Numbers	No. 20013 4 Numbers	No. 20014 2 Numbers	No. 20015 3 Numbers	No. 20016 4 Numbers	No. 20017 2 Numbers	No. 20018 3 Numbers	No. 20019 4 Numbers	No. 20020 2 Numbers	No. 20021 3 Numbers	No. 20022 4 Numbers
2003	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
2004	2			2			2			2			2		
2005		2			2			2			2			2	
2006			2			2			2			2			2
2007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1958				1	1	1									
1959							1	1	1						
20023										1	1	1			
20024													1	1	1
5/16"x3/4" R.H. Stove Bolt with Sq. Nut.	4	4	8	4	4	8	4	4	8	4	4	8	4	4	8
5/16"x1" R.H. Stove Bolt with Sq. Nut.		2			2			2			2			2	
5/16"x7/8" F.H. Stove Bolt with Sq. Nut.	2		2	2		2	2		2	2		2	2		2
5/16" Spring Washer	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3/8"x3" ✱ Carriage Bolt										2	2	2	2	2	2

✱-Omit for Bracket Post use 3/8"x1-1/4" Sq.Hd. Machine Bolt with Hex.Nut and 2 Cut Washers.


2006
2003
20023
3/8"x3" Carriage Bolts
1446
5/16"x 7/8" F.H. Stove Bolt with Sq. Nut.
5/16"x3/4" R.H. Stove Bolt with Sq. Nut.
2006
5/16" Spring Washer

ENLARGED VIEW SHOWING
APPLICATION TO SIGNAL BRIDGE
(NO. 20019 SHOWN)

Typical ordering reference:

"____ No. 2009 signal number board assembly complete having number "324", Dwg. S-200."

NOTES:

Bolts, Nuts, and washers shall be cadmium plated.

Number boards shall be manufactured and assembled in Zanesville Signal Shop.

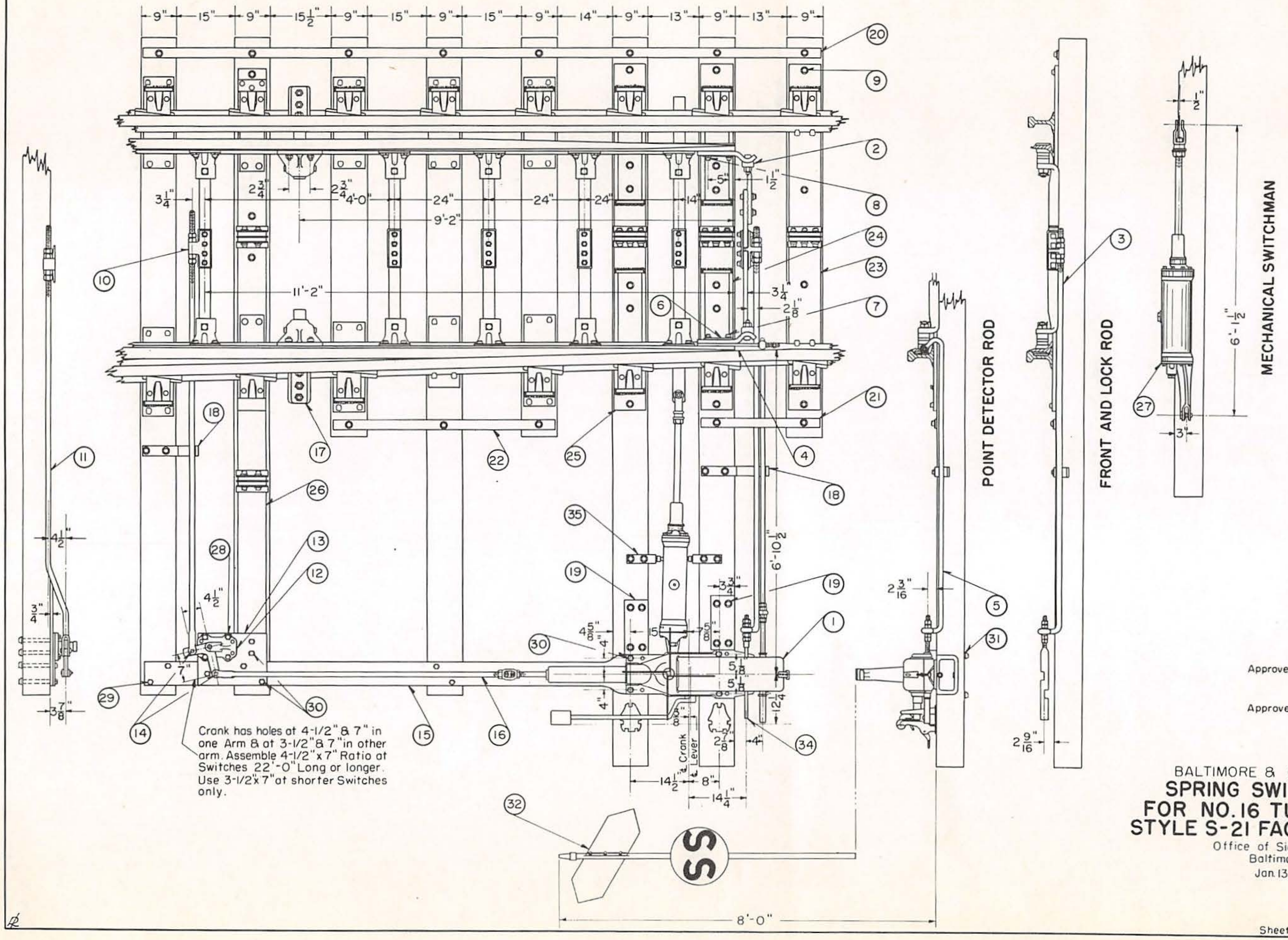
Approved: ______
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
SIGNAL NUMBER BOARDS
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
March 1, 1951.

Sheet No. 3

S-200-A

Adopted: 4-26-50.
New plan made account Signal B 16-51.
& Cantilever Vert. Supports sho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2 3/4"
2 3/4"
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14"
9'-2"
5"
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11'-2"
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2 1/8"
4 1/2"
3/4"
3 7/8"
4 1/2"
7"
4 5/8"
4"
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7 5/8"
3 3/4"
5 1/8"
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4"
8"
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12 1/4"
6'-10 1/2"
2 1/8"
4"
14 1/2"
8"
14 1/4"
℄ Crank
℄ Lever
2 3/16"
2 9/16"
8'-0"
1/2"
6'-1 1/2"
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SS
POINT DETECTOR ROD
FRONT AND LOCK ROD
MECHANICAL SWITCHMAN

Crank has holes at 4-1/2" & 7" in one Arm & at 3-1/2" & 7" in other arm. Assemble 4-1/2" x 7" Ratio at Switches 22'-0" Long or longer. Use 3-1/2" x 7" at shorter Switches only.

NOTES:

Insulated Switch Rods shall conform to Chief Engineer's Drawing No. 36057-B.

Approved: A. L. Riley
Chief Engineer

Approved: A. L. Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

SPRING SWITCH LAYOUT FOR NO. 16 TURNOUT USING STYLE S-21 FACING POINT LOCK

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

2-7-50-New Plan Made.
5-16-51-Adopted.
11-18-52-Rev.
3-30-54-Spring Switch Sign Added.
1-13-59-1532 rev.

Sheet No. 1

S-201-D

MATERIAL LIST FOR SPRING SWITCH LAYOUT WITH NO.16 TURNOUT USING STYLE "S-21" FACING POINT LOCK

ITEM	NUMBER	REQ'D.	NAME		DRAWING
1	252310	1	Style "S-21" Facing Point Lock Switch Movement	U.S.& S.Co.	C-16730 (sh.3)
2	1630	1	Swivel Type Front Rod Assembly		S-163-C
3	18315	1	Lock Rod Connecting Rod Assembly		S-183-D (sh.2)
4	273485	1	Switch Circuit Controller Lug Assembly	U.S. & S. Co.	B8060 (sh.137).
5	274335	1	Point Detector Rod Assembly	U.S. & S. Co.	B8887 (sh.179).
6	125512	2	Switch Lug Plates		S-364
7	15424	2	3/4" Dia. x 5-1/2" Front Foot Bolt Assembly		S-154-F (sh.1).
8	15425	2	3/4" Dia. x 4-3/4" " " " "		S-154-F (sh.1).
9	1539	48	Galvanized Drive Spikes		S-153-H, (sh.2).
10	218167	1	Adjusting Switch Bracket (A.A.R. Dwg. 1392)	U.S.& S.Co.	B8060 (sh.80).
11	290761	1	Operating Rod Assembly	U.S.& S.Co.	B9801 (sh.106A).
12	184717	1	One-way Horizontal Crank Stand Assembly	U.S.& S.Co.	C4953 (sh.30).
13	289702	1	Base Plate for Horizontal Crank Stand	U.S.& S.Co.	B9375 (sh.135).
14	188149	2	7/8" Dia. Pins with 3/16" x 1-1/2" S. Cotters & 1/8" P.T. Straight Lub. Fitting.	U.S.& S.Co.	8089 (sh.114).
15	289344	1	Connecting Plate	U.S.& S.Co.	B9375 (sh.134).
16	108950	1	Connecting Rod Complete	U.S.& S.Co.	B7722 (sh.46).
17	231923	2	Roller Bearing	U.S.& S.Co.	C16600 (sh.5).
18	252755	2	Guide Support	U.S.& S.Co.	10914 (sh.1084).
19	185704	2	Butt Plates	U.S.& S.Co.	B9375 (sh.18).
20	289345	1	Tie Strap 2-1/2" x 1/2" x 12'-6-1/2"	U.S.& S.Co.	B9613 (sh.71).
21	1531-4	1	Tie Strap 2-1/2" x 1/2" x 2'-5-1/2"		S-153-H (sh.1).
22	1531-1	1	Tie Strap 2-1/2" x 1/2" x 4'-4"		S-153-H (sh.1).
23		1	No. 1 Insulated Gauge Plate Assembly (Shown on Pg. 207 Roadway & Track Standard Book.)		37020
24		1	No. 2 " " " " " " " " " " " "		37020
25		1	No. 3 " " " " " " " " " " " "		37020
26	252638	1	Insulated Gauge Plate Assembly	U.S.& S.Co.	B8831 (sh.75).
27	20310	1	Model "B" Mechanical Switchman Assembly		S-203 (sh.1).
28		5	3/4"-10 x 2-3/4" Long Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer		
29		4	3/4"-10 x 9-1/2" " " " " " " " " " " "		
30		8	3/4"-10 x 10" " " " " " " " " " " "		
31	15320	12	Raco Bolt Grip for 3/4" dia. Bolt (Raco No. 589-1).		S-153-H (sh.3)
32		1	Spring Switch Sign		36353-B
33					
34	260122	1	Lock Rod	U.S.& S.Co.	B-8166 (sh.442)
35	2039	1	Roller Support Assembly		S-203 (sh.1).

NOTES:

When ordering Insulated Gauge Plates specify weight and section of rail Chief Engineer's Drawing No. 37020.

Order must specify whether L.H. or R.H. Layout.

Approved: Riley
Chief Engineer

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

MATERIAL LIST FOR SPRING SWITCH LAYOUT FOR NO.16 TURNOUT USING STYLE S-21 FACING POINT LOCK

Office of Signal Engineer
Baltimore Md.
Jan. 13, 1959

Adopted-5-16-51
11-18-52-Rev.
3-12-57-Rev.
1-13-59-1532 rev.

Sheet No.2

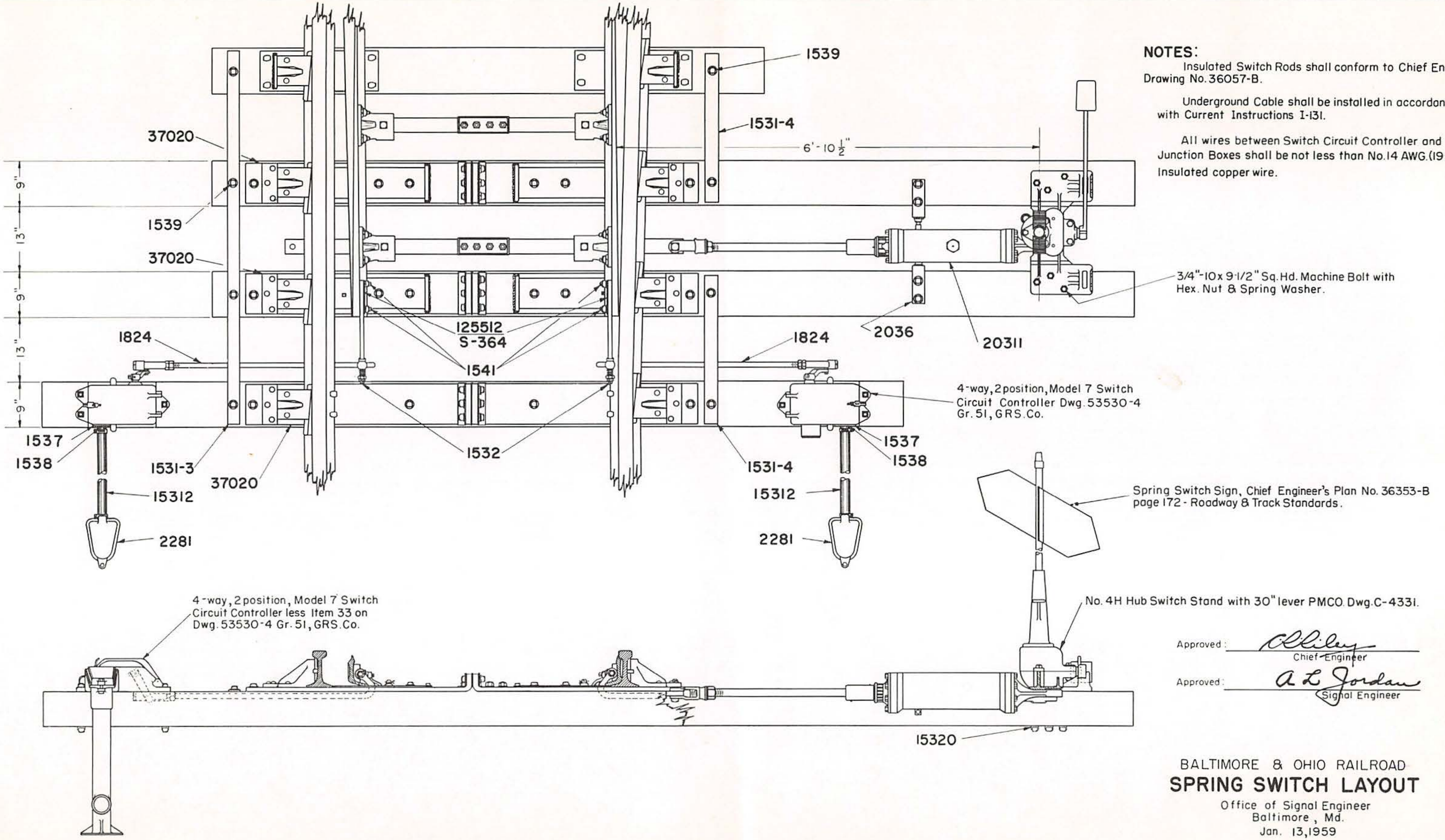
S-201-D

NOTES:

Insulated Switch Rods shall conform to Chief Engineer's Drawing No. 36057-B.

Underground Cable shall be installed in accordance with Current Instructions I-131.

All wires between Switch Circuit Controller and Junction Boxes shall be not less than No. 14 AWG. (19 strand) Insulated copper wire.


1539
1531-4
6'-10 1/2"
37020
9"
1539
13"
37020
9"
125512
S-364
1541
2036
20311
3/4"-10x 9-1/2" Sq. Hd. Machine Bolt with Hex. Nut & Spring Washer.
1824
1824
13"
9"
4-way, 2 position, Model 7 Switch Circuit Controller Dwg. 53530-4 Gr. 51, GRS. Co.
1537
1538
1531-3
37020
1532
1531-4
1537
1538
15312
15312
2281
2281
Spring Switch Sign, Chief Engineer's Plan No. 36353-B page 172 - Roadway & Track Standards.
4-way, 2 position, Model 7 Switch Circuit Controller less Item 33 on Dwg. 53530-4 Gr. 51, GRS. Co.
No. 4H Hub Switch Stand with 30" lever PMCO. Dwg. C-4331.
15320

Approved: C. Riley
Chief Engineer

Approved: A L Jordan
Signal Engineer

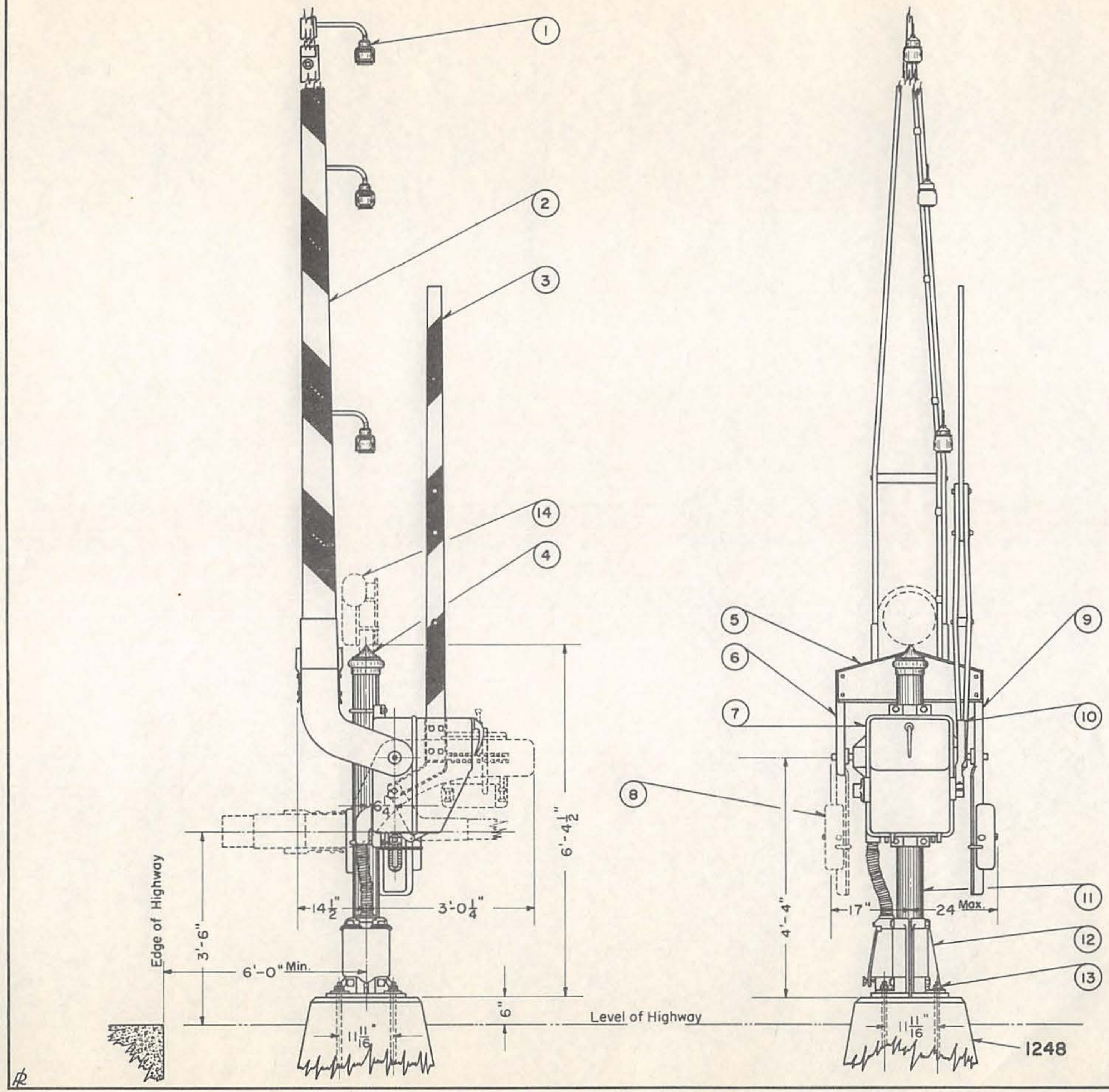
BALTIMORE & OHIO RAILROAD

SPRING SWITCH LAYOUT

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Adopted: 4-25-50.
Revised: 11-18-52.
3-30-54: Spring Switch Sign added.
Revised: 3-12-57.
1-13-59: 1532 rev.

S-202-D



ITEM	DESCRIPTION		DRAWING
1	Type 1585 Gate Light	WRRS	1585
2	Roadway Arm complete less Lights	WRRS	3565-34L
3	Sidewalk Arm	WRRS	3565-60SW
4	Short Pinnacle A.A.R.12451		S-362
5	Gate Arm Support	WRRS	3565-105
6	Gate Support Arm	WRRS	3565-101
7	Crossing Gate Mechanism, 12 Volt D.C., 90° operation, power down, roadway and sidewalk arms	WRRS	3566-122C-90
8	L.H. Gate and Counterweight assembly	WRRS	3565-102L
9	R.H. Gate and Counterweight assembly	WRRS	3565-103R
10	Sidewalk Arm Bracket	WRRS	3565-111
11	5"x 6'-0" pipe mast	WRRS	715-16
12	Junction Box Clamp Type Base	WRRS	2149-11
13	1"x 36" Galvanized anchor bolts complete with hex. nut and flat washer A.A.R. 11079.		S-311
14	12 Volt D.C. Crossing Bell with adapter for "5" pipe	WRRS	222FR

NOTES:

During and after erection of gates care must be exercised to see that gate arms safely clears all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Gate lights shall conform to current A.A.R. specification 236–.

Item 8, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

Order must specify length of Roadway & Sidewalk Arms.

Roadway & Sidewalk Arm shall be painted in accordance with Dwg. S-402, residue of painting in accordance with Instructions I-134.

Lights shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lights from the view of an approaching traveler.

Approved: AHHunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

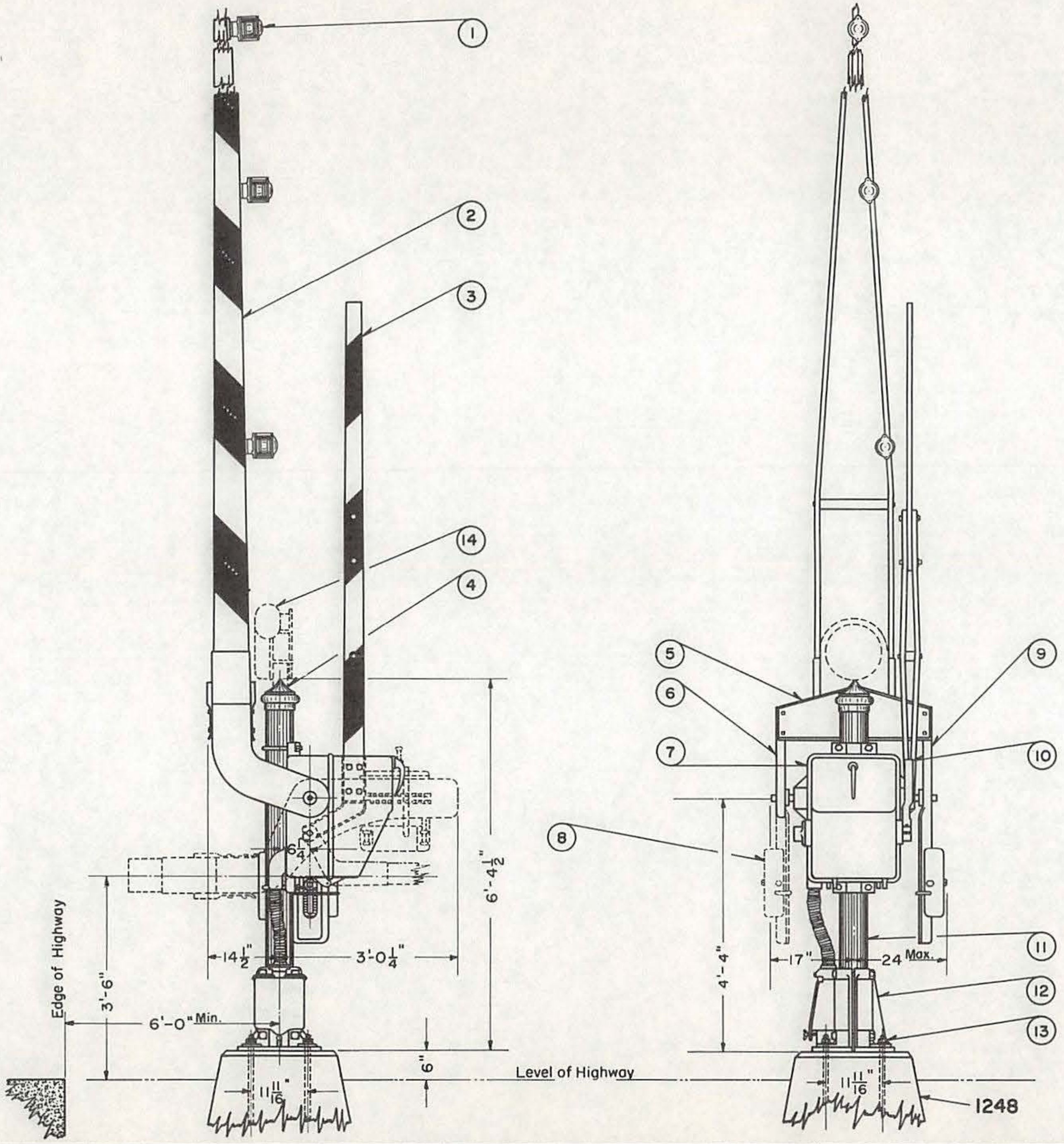
AUTOMATIC ROADWAY & SIDEWALK GATE ARMS MOUNTED ON STUB MAST

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 7, 1950.

Sheet No. 1

S-204

Adopted: 5-15-51.



ITEM	DESCRIPTION		DRAWING
1	No. 71615X Transport Products Gate Lamp	T.P.C.	E3
2	Roadway Arm complete less Lamps.	WRRS	3565-34L
3	Sidewalk Arm	WRRS	3565-60SW
4	Short Pinnacle A.A.R. 12451		S-362-B
5	Gate Arm Support	WRRS	3565-105
6	Gate Support Arm	WRRS	3565-101
7	Crossing Gate Mechanism, 12 Volt D.C., 90° operation, power down, roadway and sidewalk arms	WRRS	3566-122C-90
8	L.H. Gate and Counterweight assembly	WRRS	3565-102L
9	R.H. Gate and Counterweight assembly	WRRS	3565-103R
10	Sidewalk Arm Bracket	WRRS	3565-111
11	5"x 6'-0" pipe mast	WRRS	715-16
12	Junction Box Clamp Type Base	WRRS	2149-11
13	1"x 36" Galvanized anchor bolts complete with hex. nut and flat washer A.A.R. 11079.		S-311
14	12 Volt D.C. Crossing Bell for 5" pipe.	WRRS	222FR

NOTES:

During and after erection of gates care must be exercised to see that gate arms safely clears all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Gate lamps shall conform to current A.A.R. specification 236 except method of mounting.

Lamps shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lamps from the view of an approaching traveler.

Order must specify length of Roadway & Sidewalk Arms.

Roadway & Sidewalk Arm shall be painted in accordance with Dwg. S-402-E, residue of painting in accordance with instructions I-134-C

Item 8, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

Approved: A L Jordan
Signal Engineer

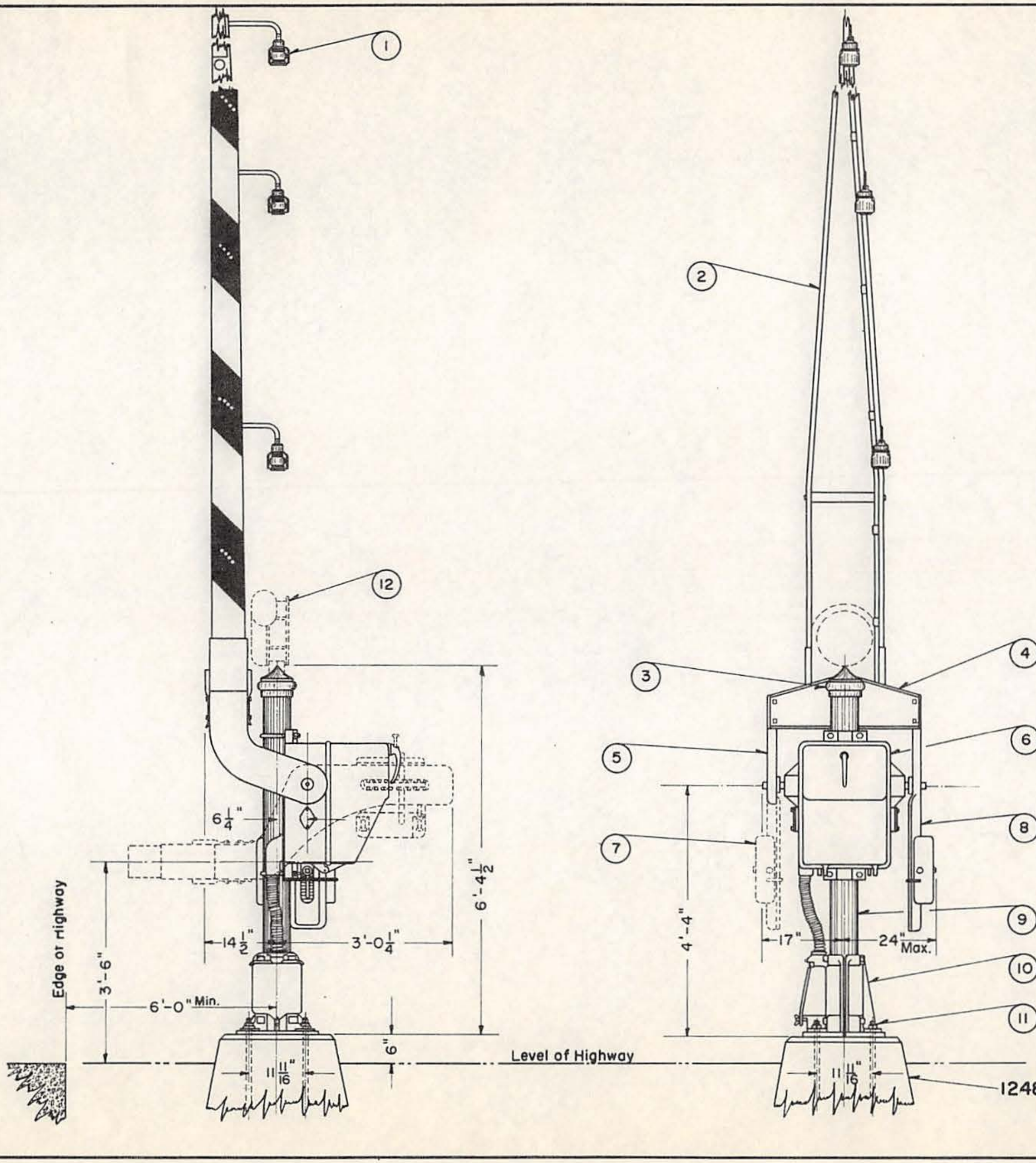
BALTIMORE & OHIO RAILROAD

AUTOMATIC ROADWAY & SIDEWALK GATE ARMS MOUNTED ON STUB MAST

Office of Signal Engineer
Baltimore, Md.
May 9, 1958

Made & Corrected 6-7-50
Adopted 5-15-51
Revised 5-9-58 Item 1 changed from W.R.R.S. gate lamp 1585 to T.P.C. gate lamp 71615X.

S-204-B



ITEM	DESCRIPTION		DRAWING
1	Type 1585 Gate Light	WRRS	1585
2	Roadway Arm complete less Lights	WRRS	3565-34L
3	Short Pinnacle		S-362
4	Gate Arm Support	WRRS	3565-105
5	Gate Support Arm	WRRS	3565-101
6	Crossing Gate Mechanism, 12 Volt D.C., 90° operation, power down, roadway arm only.	WRRS	3566121C90
7	L.H. Gate and Counterweight assembly	WRRS	3565-102L
8	R.H. Gate and Counterweight assembly	WRRS	3565-103R
9	5" x 6'-0" pipe mast	WRRS	715-16
10	Junction Box Clamp Type Base	WRRS	2149-11
11	1" x 36" Galvanized anchor bolts complete with hex. nut and flat washer A.A.R. 11079.		S-311
12	12 Volt D.C. Crossing Bell with adapter for 5" pipe	WRRS	222FR

NOTES:

During and after erection of gates care must be exercised to see that gate arm safely clears all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Gate lights shall conform to current A.A.R. specification 236—

Item 7, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

Order must specify length of Roadway Arm.

Gate Arm shall be painted in accordance with Dwg. S-402, residue of painting in accordance with Instructions I-134.

Lamps shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lights from the view of an approaching traveler.

Approved: ____________
Chief Eng'r. Comm. & Sigs.

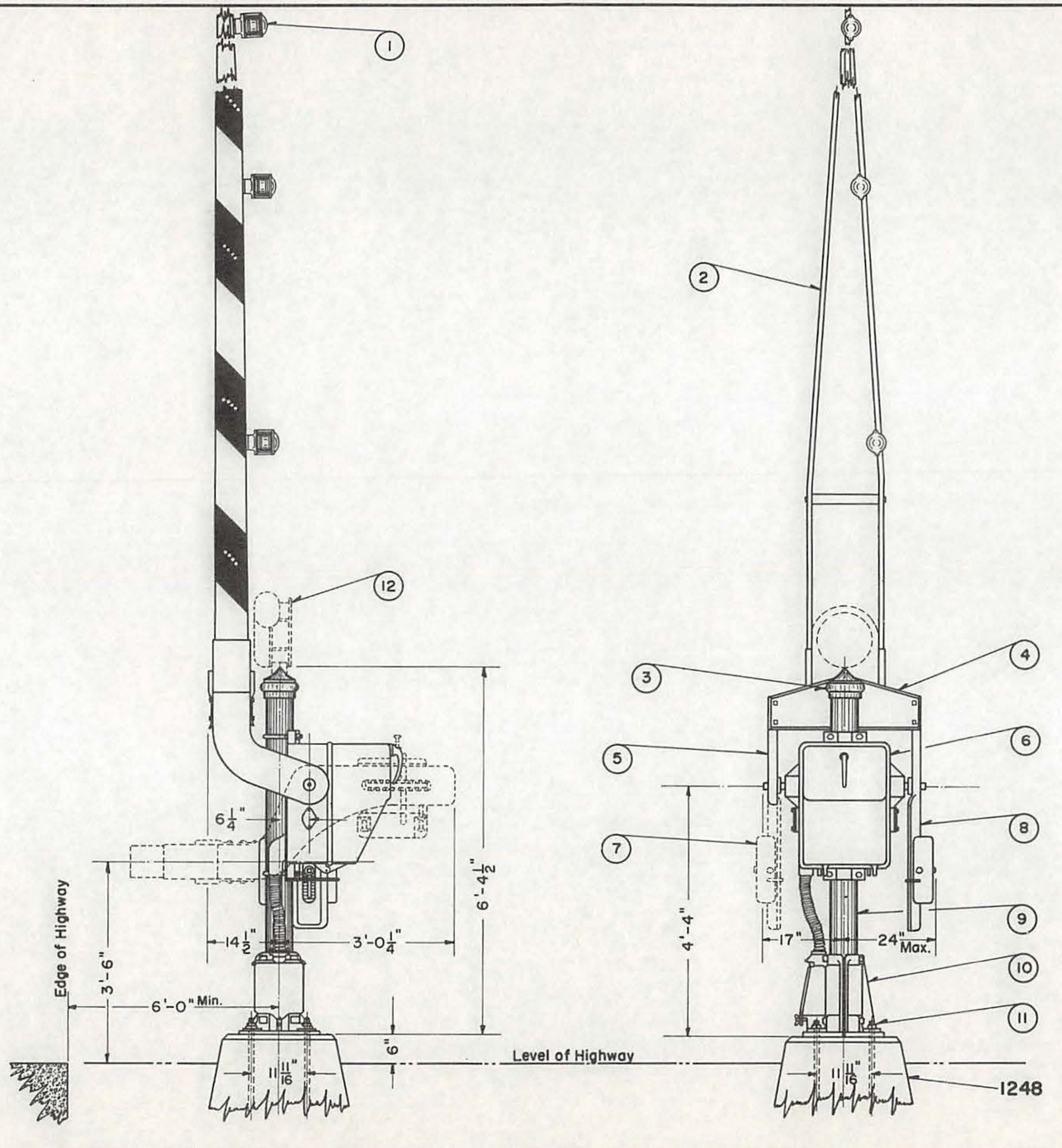
BALTIMORE & OHIO RAILROAD

AUTOMATIC ROADWAY GATE ARM MOUNTED ON STUB MAST

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 7, 1950

S-205

Adopted: 5-15-51



ITEM	DESCRIPTION		DRAWING
1	No. 71615X Transport Products Gate Lamp	T.P.C.	E3
2	Roadway Arm complete less Lamps	WRRS	3565-34L
3	Short Pinnacle A.A.R 12451		S-362-B
4	Gate Arm Support	WRRS	3565-105
5	Gate Support Arm	WRRS	3565-101
6	Crossing Gate Mechanism, 12 Volt D.C., 90° operation, power down, roadway arm only.	WRRS	3566121C90
7	L.H. Gate and Counterweight assembly	WRRS	3565-102L
8	R.H. Gate and Counterweight assembly	WRRS	3565-103R
9	5"x 6'-0" pipe mast	WRRS	715-16
10	Junction Box Clamp Type Base	WRRS	2149-11
11	1"x 36" Galvanized anchor bolts complete with hex. nut and flat washer A.A.R. 11079.		S-311
12	12 Volt D.C. Crossing Bell for 5" pipe	WRRS	222FR

NOTES:

During and after erection of gates care must be exercised to see that gate arm safely clears all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Gate lamps shall conform to current A.A.R. specification 236 except method of mounting.

Lamps shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lamps from the view of an approaching traveler.

Order must specify length of Roadway Arm.

Gate Arm shall be painted in accordane with Dwg. S-402-E, residue of painting in accordance with instructions I-134-C.

Item 7, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

Approved: A L Jordan
Signal Engineer

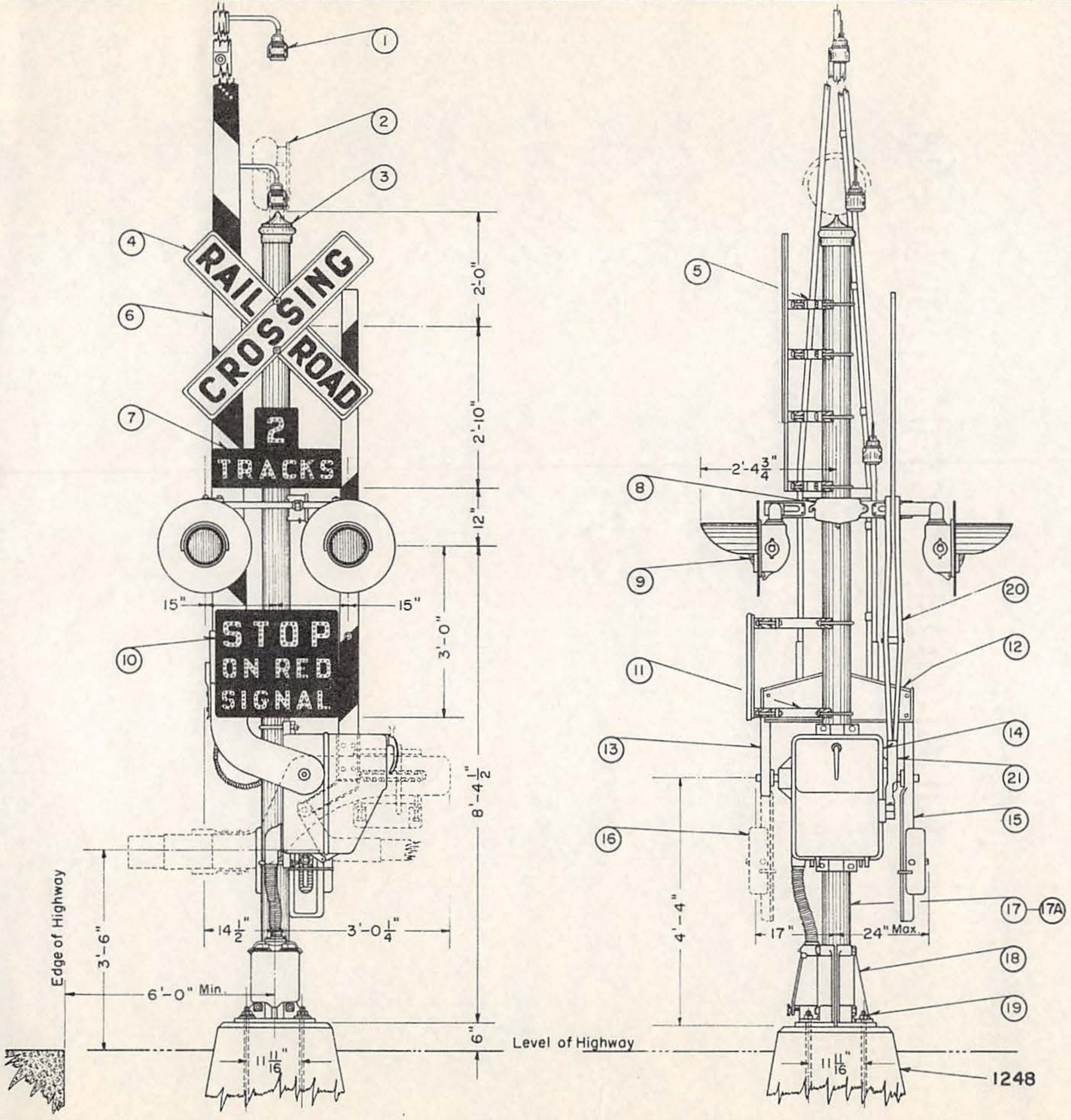
BALTIMORE & OHIO RAILROAD

AUTOMATIC ROADWAY GATE ARM MOUNTED ON STUB MAST

Office of Signal Engineer
Baltimore, Md.
May 9, 1958

Made & Corrected: 6-7-51
Adopted: 5-15-51
Revised 5-9-58 Item 1 changed from W.R.R.S. gate lamp 1585 to T.P.C. gate lamp 71615X.

S-205-B



ITEM	DESCRIPTION	DRAWING
1	Type 1585 Gate Light. WRRS	1585
2	12 Volt D.C. Crossing Bell with adapter for 5" pipe. WRRS	222FR
3	Short Pinnacle AAR 12451.	S-362
4	90° Cast-Iron Crossing Sign No.16401.	S-413
5	Extension Bracket for Items 4 and 7. WRRS	3366-40
6	Roadway Arm complete less Lights. WRRS	3565-34L
7	Reflector Multiple Track Sign assembly, Vitreous Enamel finish No. 164513.	S-417-D
8	Junction Box Lamp Arm assembly WRRS	950-74
9	Flashing Light Signal Unit WRRS	950-201
10	Reflector Stop on Red Signal Sign assembly, Vitreous Enamel finish No. 16468.	S-418-D
11	Extension Bracket for Item 10 WRRS	3366-140
12	Gate Arm Support WRRS	3565-105
13	Gate Support Arm WRRS	3565-101
14	Crossing Gate Mechanism, 12 Volt, D.C., 90° operation, power down, roadway and sidewalk arms. WRRS	3566-122C-90
15	R.H. Gate and Counterweight assembly WRRS	3565-103R
16	L.H. Gate and Counterweight assembly WRRS	3565-102L
17	5" x 13'-10" pipe mast	
17A	5" x 15'-7" pipe mast (Use only when Type 855-20 Lamp arm is required).	
18	Junction Box Clamp Type Base WRRS	2149-11
19	1" x 36" Galvanized anchor bolts complete with Hex. nut and flat washer AAR 11079.	S-311-D
20	Sidewalk Arm WRRS	3565-60SW
21	Sidewalk Arm Bracket WRRS	3565-111

NOTES:

During and after erection of gates care must be exercised to see that gate arms safely clear all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Where there are two or more tracks specify numeral required. (Track signs are not required in the State of Illinois).

When reflector crossing signs are required they shall conform to No. 16429 Dwg. S-416-E.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Gate lights shall conform to current AAR specification 236—

Light units shall conform to current AAR specification 190—

Lights shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lights from the view of an approaching traveler.

Item 16, L. H. Gate & Counterweight assembly required only for gate arm longer than 24 ft.

Order must specify length of Roadway and Sidewalk Arms.

Roadway Arm & Sidewalk Arm shall be painted in accordance with Dwg. S-402, residue of painting in accordance with Instructions I-134.

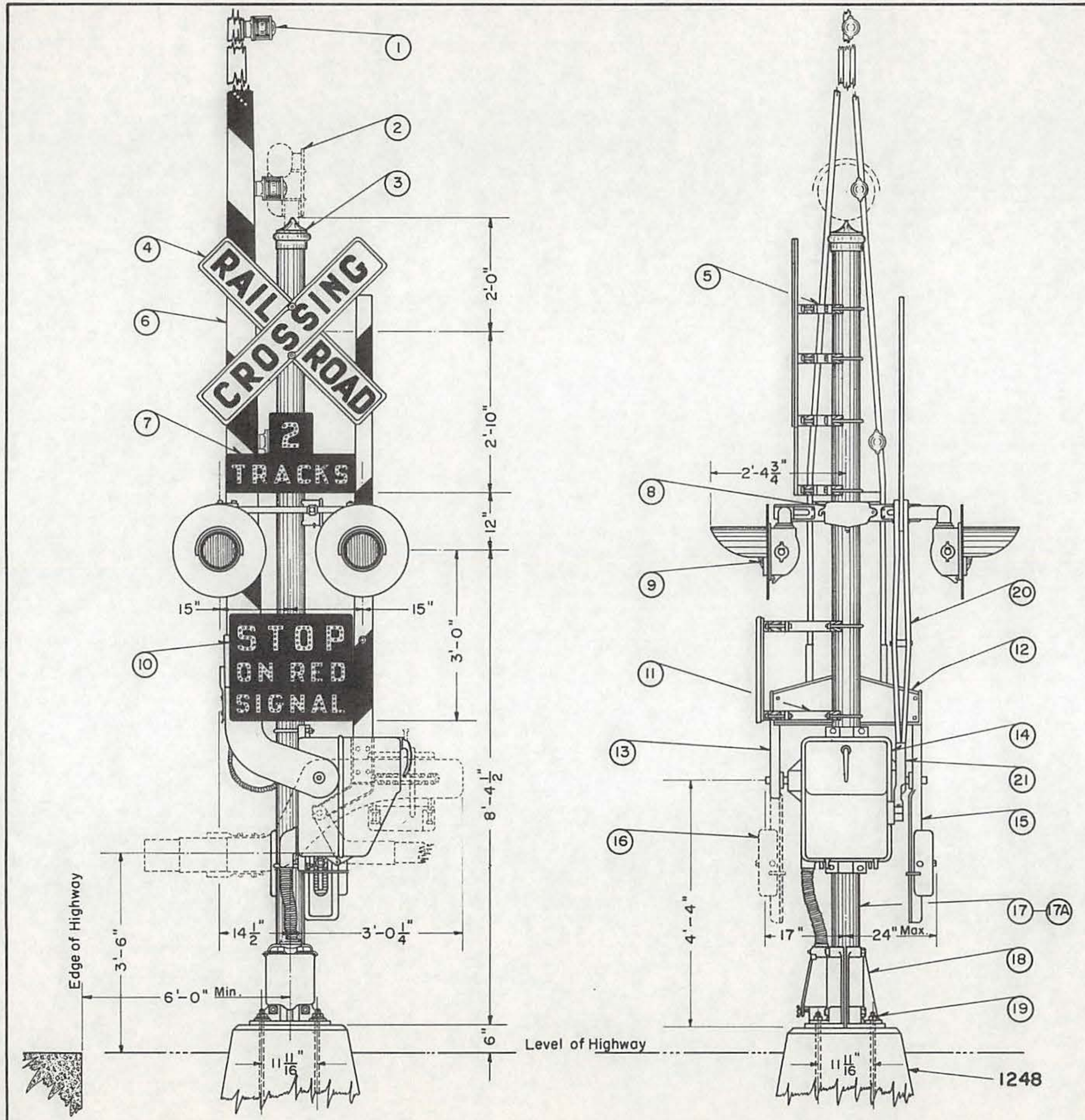
Approved: ______________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH AUTOMATIC ROADWAY & SIDEWALK GATE ARMS

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
June 15, 1950

S-206



ITEM	DESCRIPTION		DRAWING
1	No. 71615X Transport Products Gate Lamp	T.P.C.	E3
2	12 Volt D.C. Crossing Bell for 5" pipe.	WRRS	222FR
3	Short Pinnacle AAR 12451.		S-362
4	90° Cast-Iron Crossing Sign No. 16401.		S-413-D
5	Extension Bracket for Items 4 and 7.	WRRS	3366-40
6	Roadway Arm complete less Lamps	WRRS	3565-34L
7	Reflector Multiple Track Sign assembly, Vitreous Enamel finish No. 164513.		S-417-E
8	Junction Box Lamp Arm assembly	WRRS	950-74
9	Flashing Light Signal Unit	WRRS	950-201
10	Reflector Stop on Red Signal Sign assembly, Vitreous Enamel finish No. 16468.		S-418-E
11	Extension Bracket for Item 10	WRRS	3366-140
12	Gate Arm Support	WRRS	3565-105
13	Gate Support Arm	WRRS	3565-101
14	Crossing Gate Mechanism, 12 Volt, D.C., 90° operation, power down, roadway and sidewalk arms.	WRRS	3566-122C-90
15	R.H. Gate and Counterweight assembly	WRRS	3565-103R
16	L.H. Gate and Counterweight assembly	WRRS	3565-102L
17	5" x 13'-10" pipe mast		
17A	5" x 15'-7" pipe mast (Use only when Type 855-20 Lamp arm is required).		
18	Junction Box Clamp Type Base	WRRS	2149-11
19	1" x 36" Galvanized anchor bolts complete with Hex. nut and flat washer AAR 11079.		S-311
20	Sidewalk Arm	WRRS	3565-60SW
21	Sidewalk Arm Bracket	WRRS	3565-111

NOTES:

During and after erection of gates care must be exercised to see that gate arms safely clear all overhead or adjacent wires. Gate mechanism must be grounded.

Distance between signal and edge of highway may be less than 6'-0" when required by local conditions.

Where there are two or more tracks specify numeral required. (Track signs are not required in the State of Illinois).

When reflector crossing signs are required they shall conform to No. 16429 Dwg. S-416-F.

Reflector signs shall be equipped with Libbey Cataphote type 3-A and 5-A reflector lenses.

Gate lamps shall conform to current AAR specification 236 except method of mounting.

Lamps shall be arranged on gate arm to insure that no one vehicle on the traveled roadway can obscure all three of the lamps from the view of an approaching traveler.

Lamp units shall conform to current A.A.R. specification 190-

Order must specify length of Roadway and Sidewalk Arms.

Roadway Arm & Sidewalk Arm shall be painted in accordance with Dwg. S-402-E residue of painting in accordance with Instructions I-134-C.

Item 16, L.H. Gate & Counterweight assembly required only for gate arms longer than 24 ft.

Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD

FLASHING LIGHT HIGHWAY CROSSING SIGNAL WITH AUTOMATIC ROADWAY & SIDEWALK GATE ARMS

Office of Signal Engineer
Baltimore, Md.
May 9, 1958

Made & Corrected 6-15-50.
Adopted 5-16-51
Revised 5-9-58 Item 1 changed from W.R.R.S. gate lamp 1585 to T.P.C. gate lamp 71615X.

S-206-B

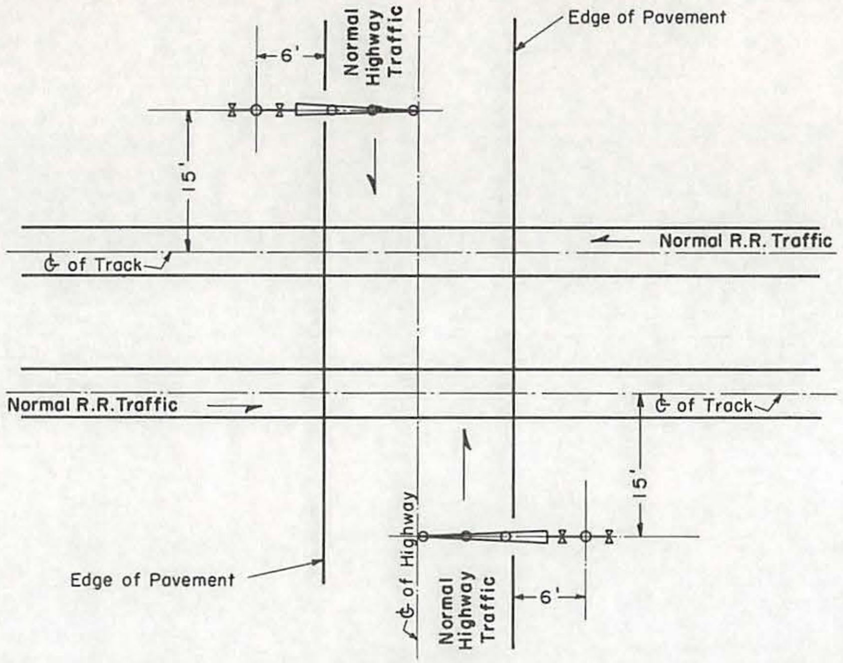

Edge of Pavement
6'
Normal Highway Traffic
15'
Normal R.R. Traffic
℄ of Track
Normal R.R. Traffic
℄ of Track
15'
℄ of Highway
Normal Highway Traffic
6'
Edge of Pavement

FIGURE 1.

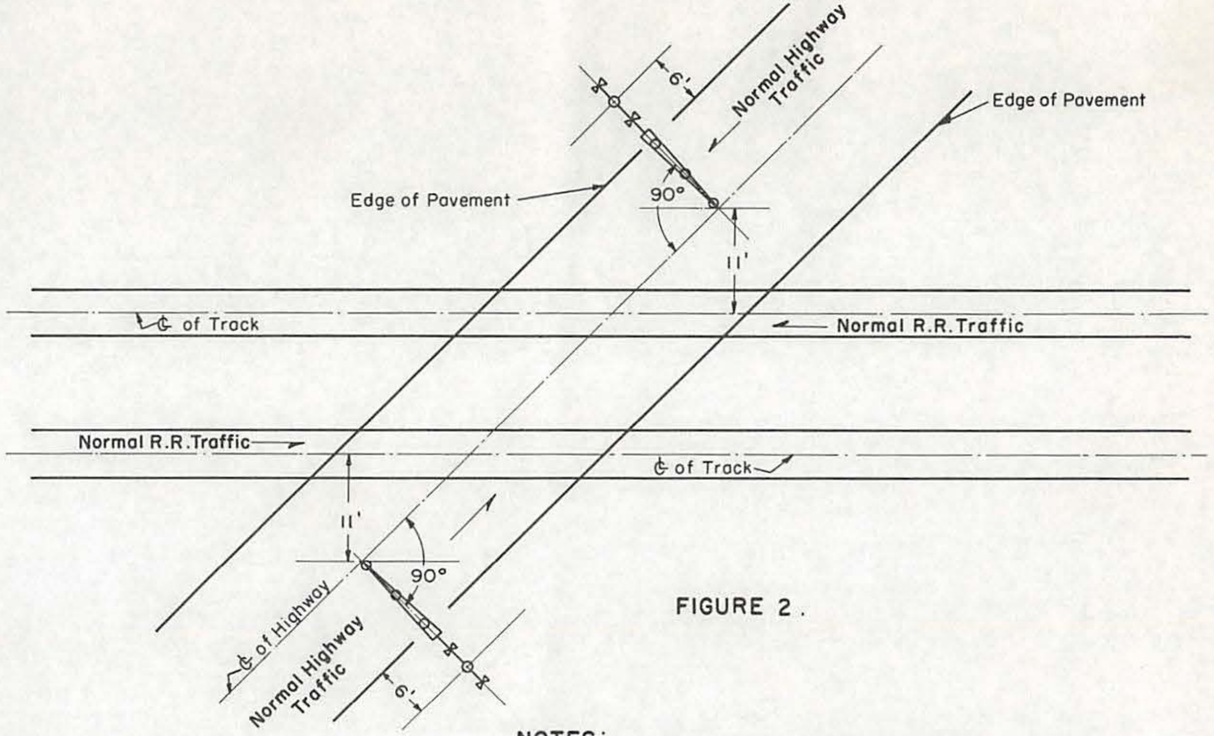

6'
Normal Highway Traffic
Edge of Pavement
Edge of Pavement
90°
11'
℄ of Track
Normal R.R. Traffic
Normal R.R. Traffic
℄ of Track
11'
90°
℄ of Highway
Normal Highway Traffic
6'

FIGURE 2.

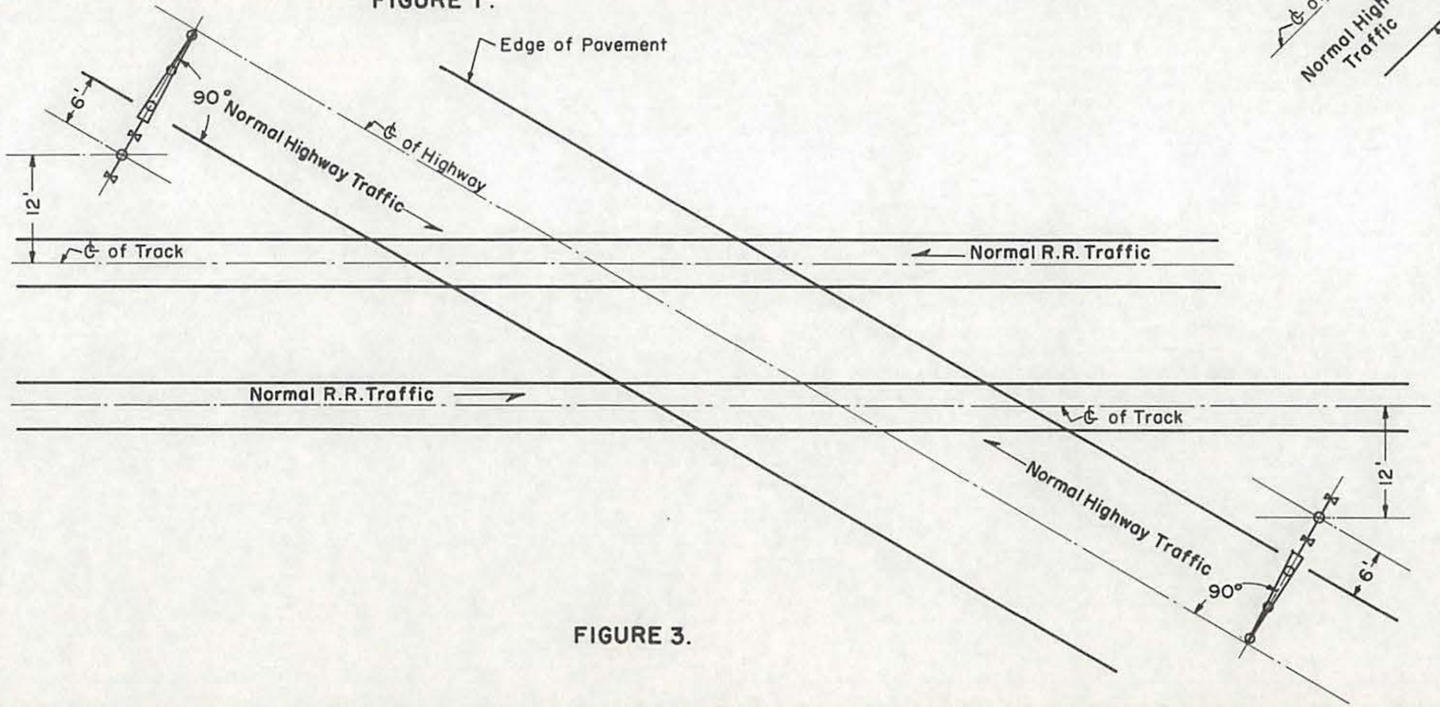

6'
90°
Normal Highway Traffic
℄ of Highway
Edge of Pavement
12'
℄ of Track
Normal R.R. Traffic
Normal R.R. Traffic
℄ of Track
Normal Highway Traffic
12'
6'
90°

FIGURE 3.

NOTES:

Arrangement and location of signals may vary to meet regulatory or local conditions.

A minimum clearance of 8'-6" must be maintained between any part of the highway crossing signal and the center line of adjacent tracks.

Approved: A L Jordan
Signal Engineer

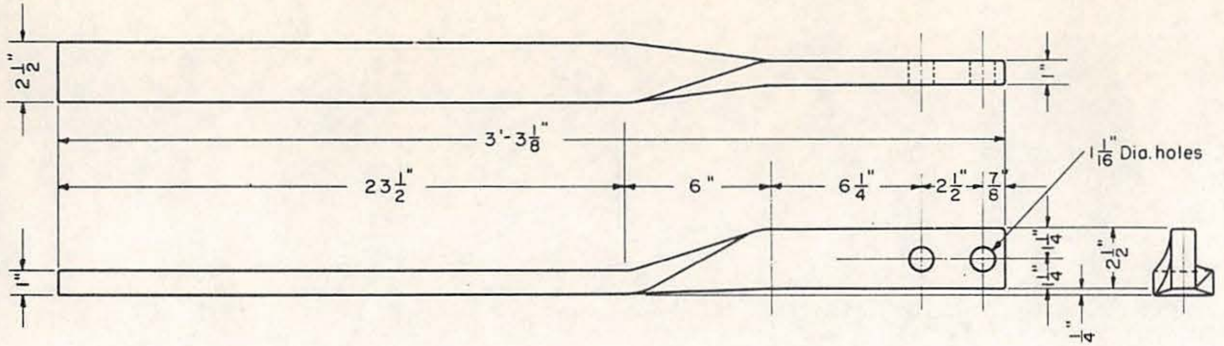
BALTIMORE & OHIO RAILROAD
TYPICAL LOCATION PLAN FOR HIGHWAY CROSSING SIGNALS
Office of Signal Engineer
Baltimore, Md.
Dec 4, 1958

Made & Corrected 7-4-50
Adopted 5-16-51

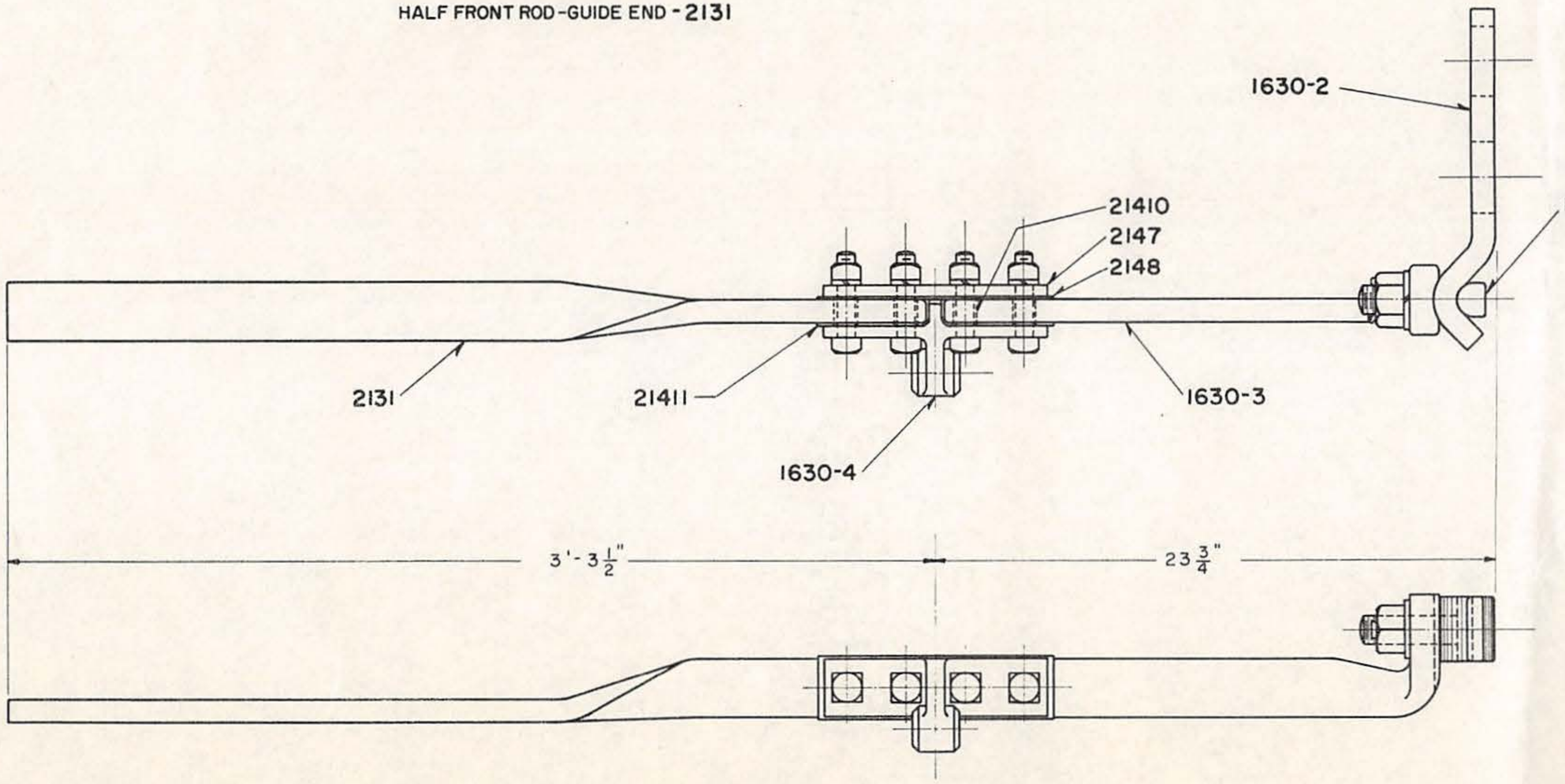
S-207-A

MATERIAL LIST FOR SWIVEL TYPE FRONT ROD USED ON SWITCH POINT DERAIL

ITEM	REQUIRED	NAME	PLAN NO.
1630-1	1	T-Bolt Assembly	S-163-B
1630-2	1	Swivel Lug	S-163-B
1630-3	1	Half Front Rod-Plain	S-163-B
1630-4	1	Switch Adjustment Bracket	S-163-B
2147	1	Splice Plate	S-214
2148	1	Fibre Insulation Plate	S-214
21411	2	Fibre Insulation Plate	S-214
21410	4	Fibre Insulation Bushings	S-214
2131	1	Half Front Rod-Guide End	S-213


2 1/2"
1"
3'-3 1/8"
23 1/2"
6"
6 1/4"
2 1/2"
7/8"
1 1/16" Dia. holes
1 1/4"
1 1/4"
2 1/2"
1"
1/4"

HALF FRONT ROD-GUIDE END - 2131


1630-2
21410
2147
2148
1630-1
2131
21411
1630-3
1630-4
3'-3 1/2"
23 3/4"

ASSEMBLY - 2130

Approved: Chief Eng'r. Maintenance

Approved: Chief Eng'r. Comm. & Sigs.

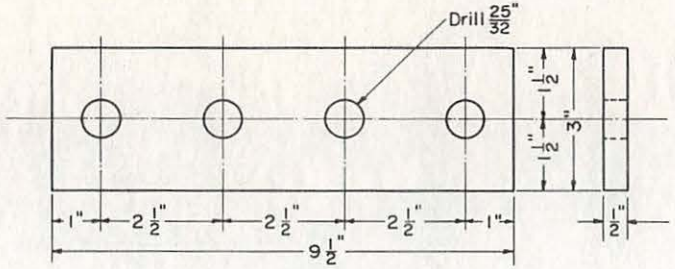
BALTIMORE & OHIO RAILROAD

SWIVEL TYPE FRONT ROD FOR SWITCH POINT DERAIL

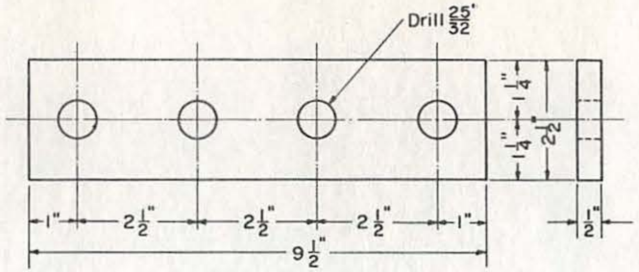
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Aug. 16, 1950

S-213

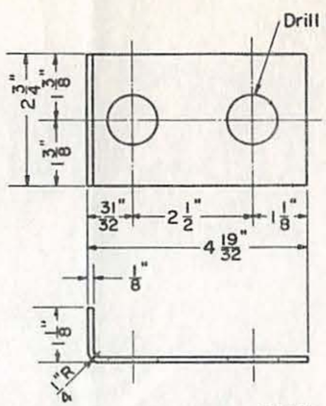
Adopted: 5-16-51.


Drill 25/32"
1 1/2"
1 1/2"
3"
1"
2 1/2"
2 1/2"
2 1/2"
1"
9 1/2"
1/2"

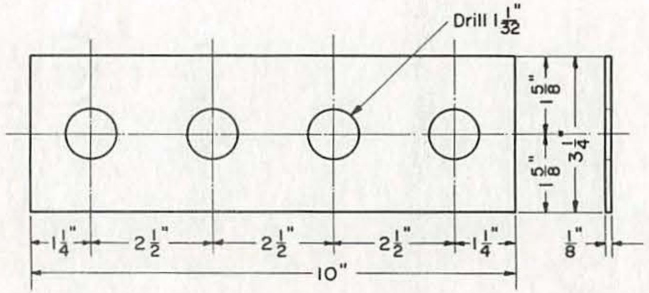
SPLICE PLATE - **2145**
C-1020 Steel


Drill 25/32"
1 1/4"
1 1/4"
2 1/2"
1"
2 1/2"
2 1/2"
2 1/2"
1"
9 1/2"
1/2"

SPLICE PLATE - **2147**
C-1020 Steel

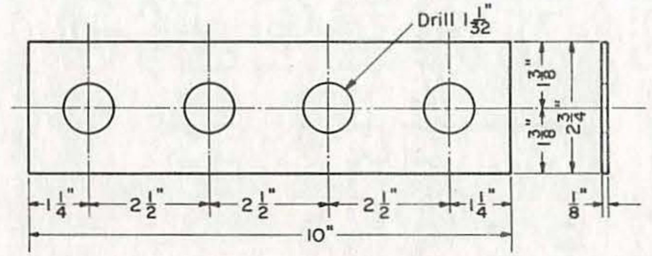

Drill 1 1/32"
2 3/4"
1 3/8"
1 3/8"
31/32"
2 1/2"
1 1/8"
4 19/32"
1/8"
1 1/8"
1/4"R

INSULATION PLATE - **21411**
Fibre

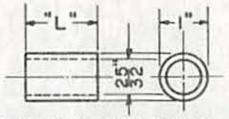

Drill 1 1/32"
1 5/8"
1 5/8"
3 1/4"
1 1/4"
2 1/2"
2 1/2"
2 1/2"
1 1/4"
10"
1/8"

INSULATION PLATE - **2146**
Fibre

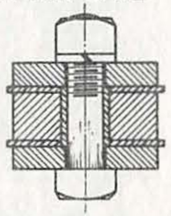
NOTE:
Fibre shall be in accordance with current A.A.R. Signal Section Spec. 13.


Drill 1 1/32"
1 3/8"
1 3/8"
2 3/4"
1 1/4"
2 1/2"
2 1/2"
2 1/2"
1 1/4"
10"
1/8"

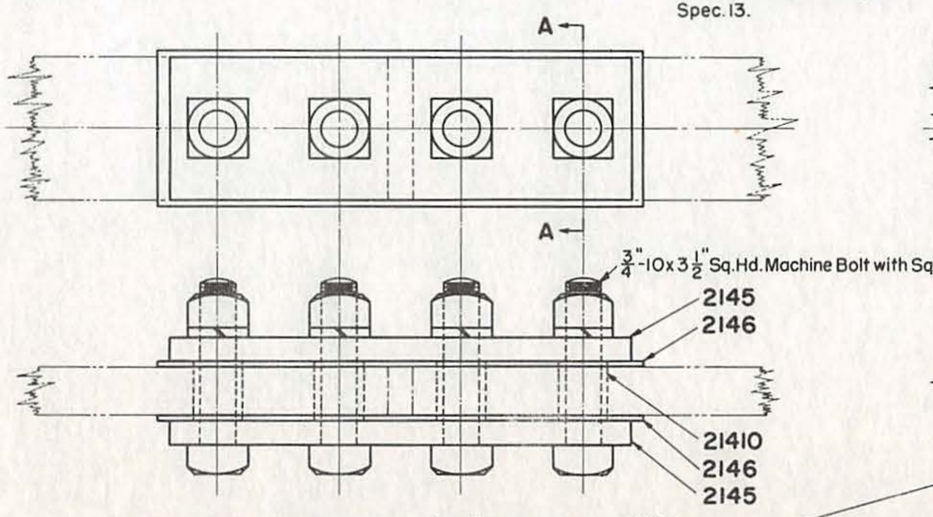
INSULATION PLATE - **2148**
Fibre



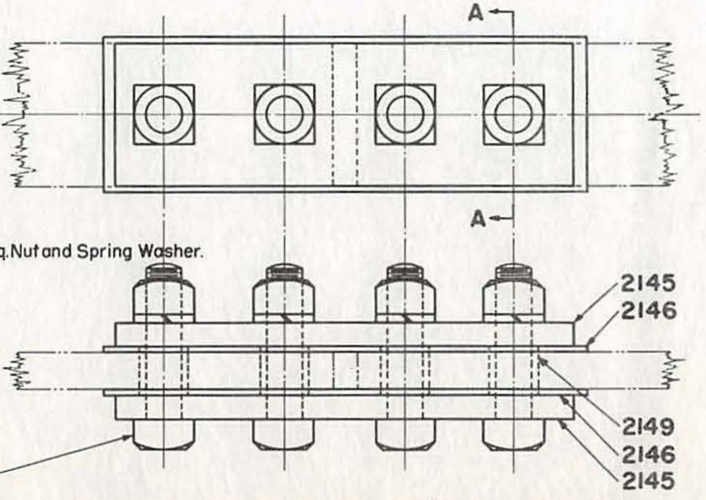
INSULATION BUSHING (Fibre)
L = 31/32" for 3/4" Rod - **2149**
L = 1-7/32" for 1" Rod - **21410**
L = 1-15/32" for 1-1/4" Rod - **21412**



SECTION "A-A"


A
A
3/4"-10x3 1/2" Sq.Hd.Machine Bolt with Sq.Nut and Spring Washer.
2145
2146
21410
2146
2145

INSULATION ASSEMBLY FOR 1" x 3" SWITCH ROD - **2140**


A
A
2145
2146
2149
2146
2145
3/4"-10 x 3 1/4" Sq.Hd.Machine Bolt with Sq.Nut and Spring Washer.

INSULATION ASSEMBLY FOR 3/4" x 3" Switch Rod - **2141**

Approved: ______________
Chief Eng'r. Maintenance

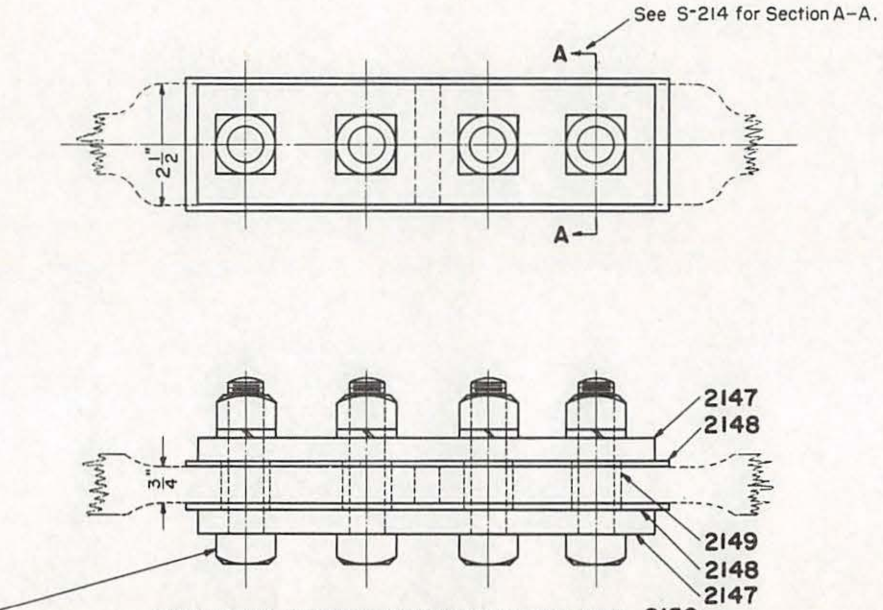
Approved: ______________
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
SWITCH ROD INSULATION
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Aug. 31, 1950

Adopted: May 16, 1951.

S-214

Adopted: 5-15-51.


See S-214 for Section A-A.
A
A
2½"
¾"
2147
2148
2149
2148
2147

INSULATION ASSEMBLY FOR NO.3607 FRONT ROD 2150

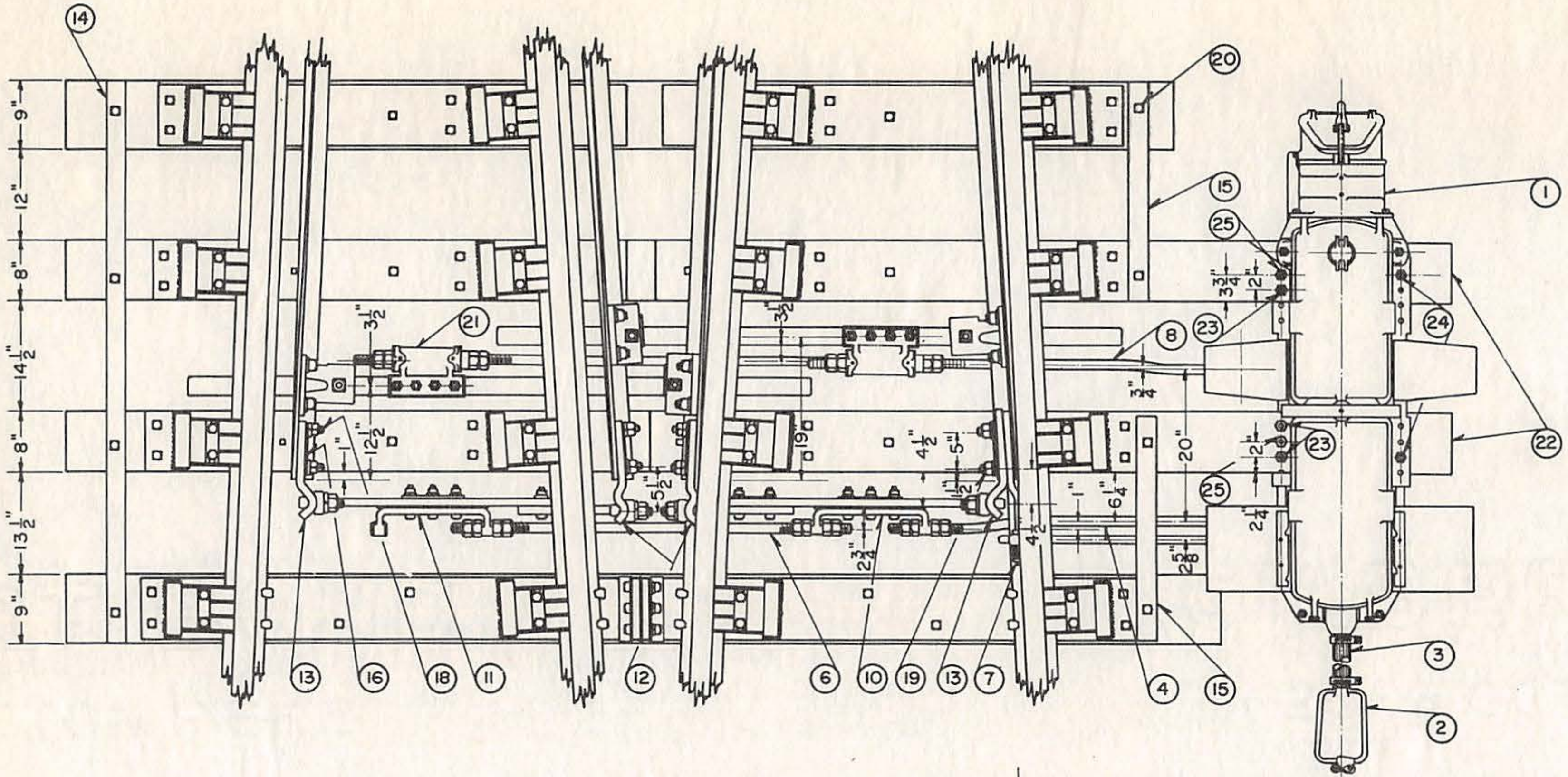
¾"-10 x 3¼" Sq. Hd. Machine Bolt with Sq. Nut and Spring Washer.

Approved: Chief Eng'r. Maintenance

Approved: Chief Eng'r. Comm. & Sigs.

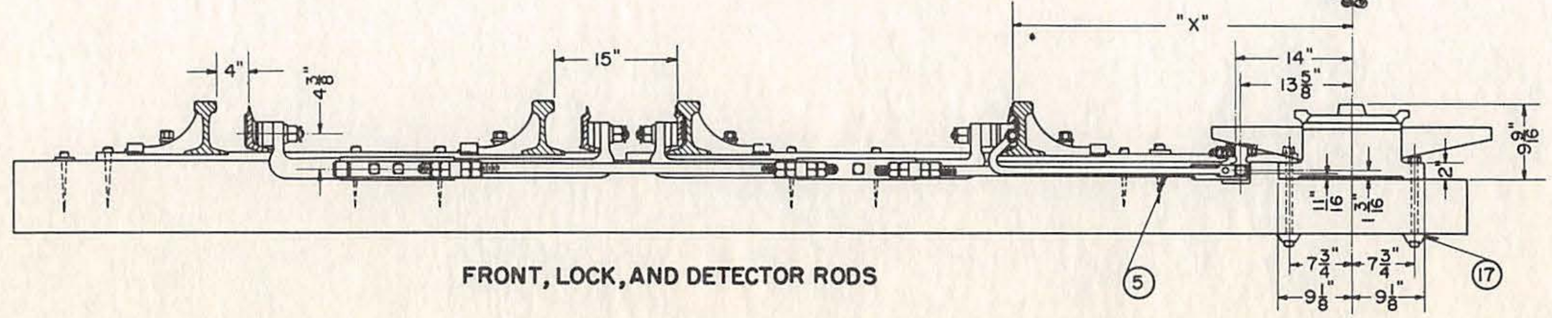
BALTIMORE & OHIO RAILROAD
INSULATION FOR NO.3607 FRONT ROD
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Aug. 31, 1950

S-215

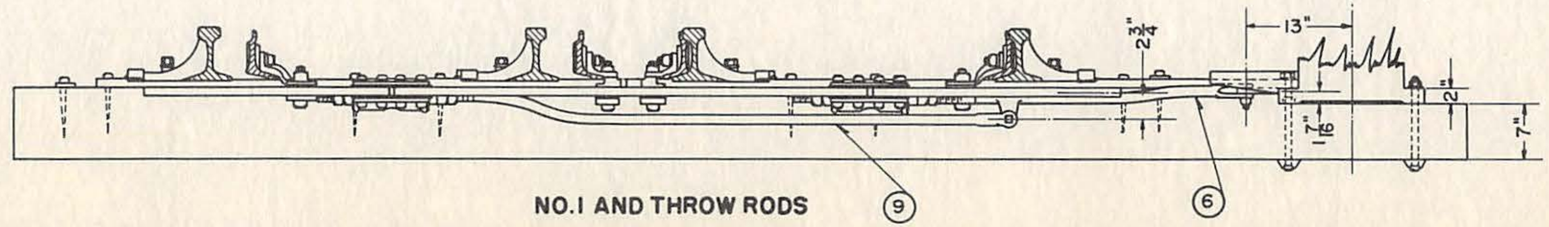

14
20
15
1
25
24
23
8
21
22
23
25
3
2
13
16
18
11
12
6
10
19
13
7
4
15
9"
12"
8"
14½"
8"
13½"
9"
3½"
3½"
¾"
12½"
19½"
5½"
4½"
5"
1"
6¼"
20"
2¼"
2¼"
2⅝"
¾"
2"
2"
4½"
1"
2¼"
2¼"

NOTES:

Dimension "X" = 3'-6" where clearance permits
Otherwise this dimension shall be 2'-8".


"X"
14"
13⅝"
15"
4"
4⅜"
9⁹⁄₁₆"
2"
2"
1¹¹⁄₁₆"
1³⁄₁₆"
7¾"
7¾"
9⅛"
9⅛"
5
17

FRONT, LOCK, AND DETECTOR RODS


13"
2¾"
2"
1⁷⁄₁₆"
7"
9
6

NO.1 AND THROW RODS

Approved: Chief Eng'r. Maintenance

Approved: Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

LAYOUT FOR 5A OR 5C SWITCH MACHINE APPLIED TO DOUBLE SLIP SWITCH

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 14, 1950

Sheet No. 1

S-216

Adopted: 5-16-51

MATERIAL LIST FOR 5A OR 5C SWITCH MACHINE APPLIED TO DOUBLE SLIP SWITCH

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See Note).	
2		1	16-way Junction Box Raco No. 583-1.	
3	15311	1	1-7/8" I.D. x 18" Long Rubber Hose complete with clamps.	S-153-C (sh.2).
4		1	Lock Rod Connecting Rod.	
5	1822	1	Point Detector Rod.	S-182-A(sh.1).
6	277722	1	Front Rod Connecting Rod. U.S.& S.Co.	B8240(sh.315).
7	1532	1	Switch Circuit Controller Lug Assembly.	S-153-C (sh.1).
8		1	Operating Rod Assembly.	
9		1	Operating Rod Connecting Rod.	
10	277775	1	Swivel Front Rod. U.S.& S.Co.	B7955(sh.660).
11	277774	1	Swivel Front Rod. U.S.& S.Co.	B7955(sh.659).
12	277723	2	Swivel Lugs. U.S.& S.Co.	B8060(sh.143).
13	277720	2	Swivel Lugs. U.S.& S.Co.	B8060(sh.145).
14	1531-3	1	2-1/2"x1/2"x6'-2" Long Tie Strap.	S-153-C (sh.1).
15	1531-5	2	2-1/2"x1/2"x 2'-5-1/2" Long Tie Strap.	S-153-C(sh.1).
16	125512	4	Switch Lug Plates.	S-364.
17	C12398	4	Cast-Iron Washers.	S-76140-A.
18		6	1" Dia.x4-1/2" Long Front Foot Bolts.	
19		2	1" Dia.x5-1/4" Long Front Foot Bolts.	
20	13811	46	Galvanized Lag Screw Spikes	S-382
21		2	Weatherproof Switch Point Adjusters.	
22		2	8"x9"x15'-0" Sawed Oak Switch Ties	
23		3	3/4"x3-1/4" Long Sq. Hd. Hex. Nut Machine Bolts with Spring Washers.	
24		2	3/4"x11-1/2" " " " " " " " " " "	
25		2	3/4"x12-1/2" " " " " " " " " " "	
26				
27				
28				
29				
30				

NOTE:
For switch machine see G.R.S.Co. Catalogue Plate J3101 or J3102.

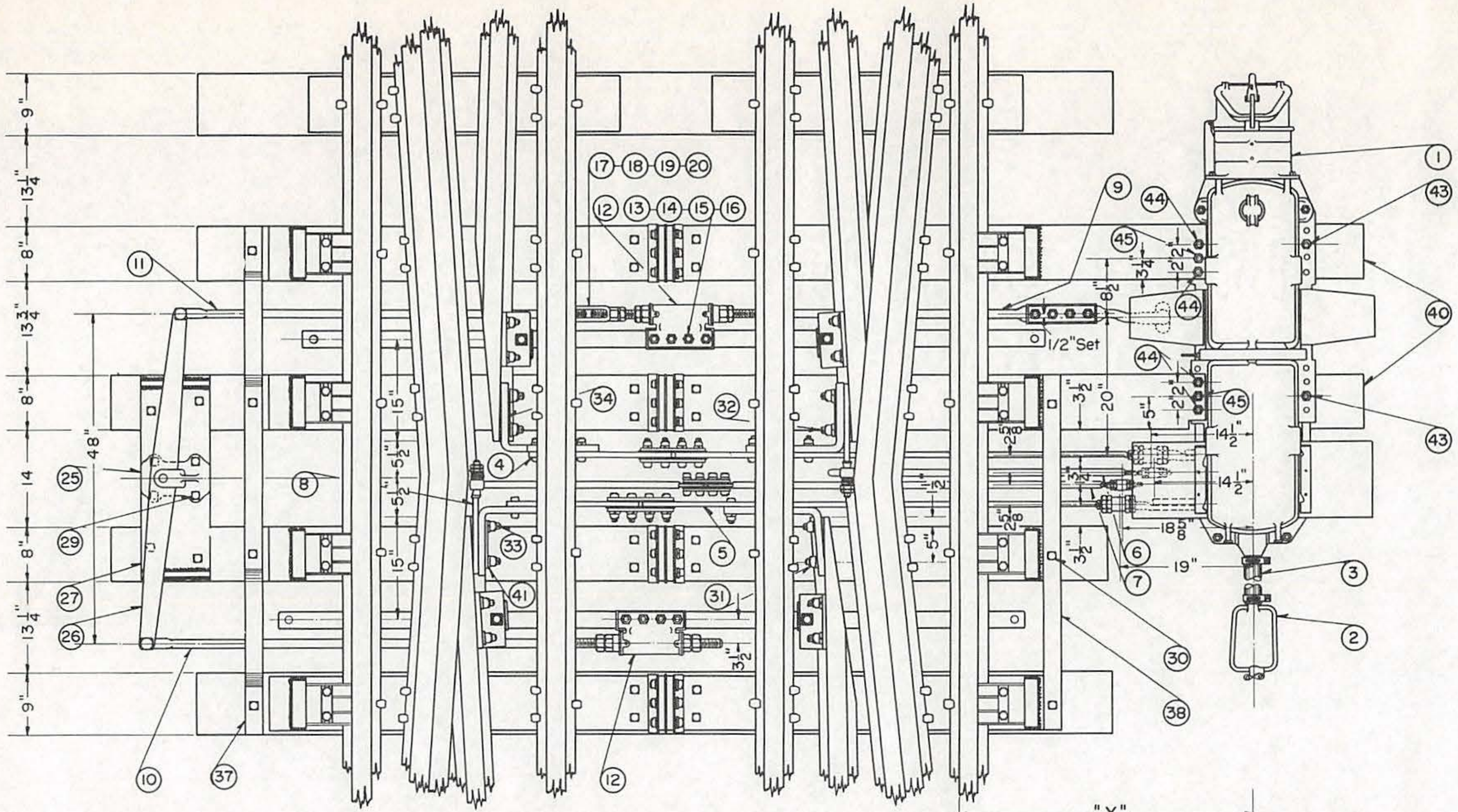
Approved: ______ Chief Eng'r. Maintenance.

Approved: ______ Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR 5A OR 5C
SWITCH MACHINE APPLIED TO
DOUBLE SLIP SWITCH
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 14, 1950

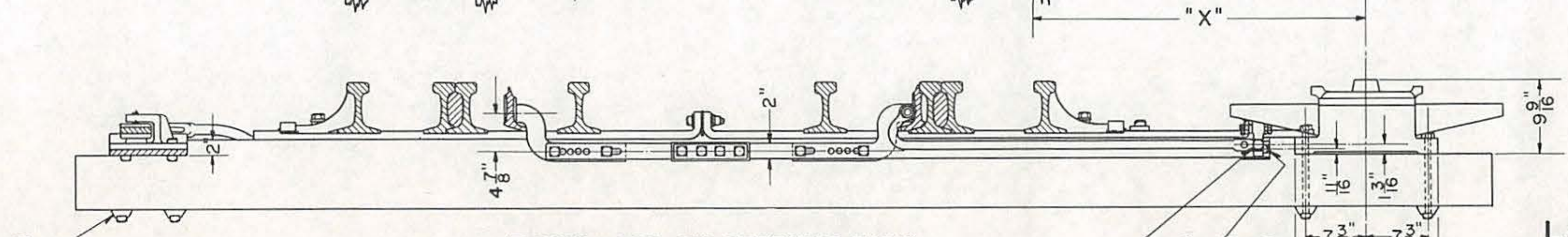
Sheet No. 2

S-216

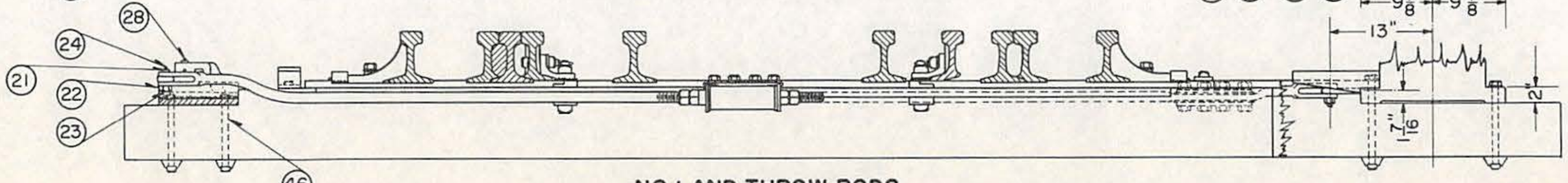

9"
13¼"
8"
13¾"
8"
14
8"
13¼"
9"
48"
15"
5½"
5½"
15"
17-18-19-20
12-13-14-15-16
1/2"Set
3¼"
8½"
2½"
3½"
20"
5"
2⅝"
1½"
2⅝"
5"
3½"
14½"
14½"
18⅝"
19"
3½"
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
㉕
㉖
㉗
㉙
㉚
㉛
㉜
㉝
㉞
㊲
㊳
(40)
(41)
(43)
(44)
(45)

NOTES:

Dimension "X"= 3'-6" where clearance permits
Otherwise this dimension shall be 2'-8".


"X"
2"
2"
4⅞"
9 9/16"
11/16"
13/16"
7¾"
7¾"
9⅛"
9⅛"
(42)
(36)-(39)
(35)-(39)

FRONT, LOCK, AND DETECTOR RODS


13"
2"
1 7/16"
㉑
㉒
㉓
㉔
㉘
(46)

NO.1 AND THROW RODS

Approved: C B Harmon
Chief Eng'r. Maintenance.

Approved: A H Hunt
Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

LAYOUT FOR 5A OR 5C SWITCH MACHINE APPLIED TO MOVABLE POINT FROG OF DOUBLE SLIP SWITCH

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 14, 1950

Adopted: 5-16-51

Sheet No.1.

S-217

MATERIAL LIST FOR 5A OR 5C SWITCH MACHINE APPLIED TO MOVABLE POINT FROG

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See Note).	
2		1	16-way Junction Box Raco No. 583-1.	
3	15311	1	1 7/8" I.D. x 18" Long Rubber Hose complete with clamps.	S-153-C(sh.2)
4		1	Front Rod Complete. R.H.	
5		1	Front Rod Complete. L.H.	
6		1	Point Detector Rod Complete.	
7		1	Insulated Point Detector Rod Complete.	
8		2	Switch Circuit Controller Lug G.R.S.Co.	43051-12 Gr.34
9		1	Operating Rod Complete. (Sw. Machine to Bracket)	
10		1	Operating Rod Complete (Adjuster to Crank).	
11		1	Operating Rod, Left Hand Thread (Turnbuckle to Crank).	
12		2	Enclosed Switch Adjuster.	
13	2148	4	Insulation Plate.	S-214
14	2147	2	Splice Plate.	S-214
15		8	Insulation Bushing.	
16		8	3/4"-10 x 3-1/2" Sq. Hd. Machine Bolt with Hex. Nut and Spring Washer.	
17		1	Turnbuckle R.H. & L.H.	36173
18		2	1-1/4" Spring Washer.	
19		1	1-1/4"-7 x 3/4" R.H. Thread Hex. Nut. G.R.S.Co.	2813
20		1	1-1/4"-7 x 3/4" L.H. Thread Hex. Nut. G.R.S.Co.	6893
21		3	7/8"-9 x 2-3/4" Sq. Hd. Bolt. G.R.S.Co.	38186-17
22		3	7/8"-9 St'd. Hex. Nut. G.R.S.Co.	47191-9
23		3	3/16" x 2" Cotter Pin. G.R.S.Co.	046
24		3	Alemite Oiler. G.R.S.Co.	34232-21
25		1	Crank Stand Complete. G.R.S.Co.	8206-1 Gr.5
26		1	Crank G.R.S.Co.	743-28
27		1	Crank Stand Plate G.R.S.Co.	46688-17
28		1	Alemite Oiler G.R.S.Co.	34232-31
29		4	3/4"-10 x 2-3/4" Sq. Hd. Machine Bolt with Hex. Nut.	
30	13811	23	Galvanized Lag Screw Spike.	S-382
31		4	1"-8 x 4" Long Front Foot Bolts.	
32		4	1"-8 x 4-3/4" Long Front Foot Bolts.	
33		8	3/16" x 1-1/4" Cotter Pin.	
34	125511	4	Switch Lug Plate	S-364
35		4	3/4"-10x2-1/2" Sq. Hd. Machine Bolts with Hex. Nuts.	
36		2	3/4"-10x2-1/4" Sq. Hd. Machine Bolts with Hex. Nuts.	
37	1531-3	1	Tie Strap	S-153-C(sh.1)
38	1531-1	1	Tie Strap	S-153-C(sh.1)
39		24	3/4" Spring Washer	
40		2	8" x 9" x 15'-0" Sawed Oak Switch Ties.	
41		8	1" Spring Washer.	
42	C12398	8	Cast-Iron Washers.	S-76140-A
43		2	3/4"-10 x 11-1/2" Sq. Hd. Machine Bolts with Hex. Nuts.	
44		4	3/4"-10 x 3-1/4" Sq. Hd. Machine Bolts with Hex. Nuts.	
45		2	3/4"-10 x 12-1/2" Sq. Hd. Machine Bolts with Hex. Nuts.	
46		4	3/4"-10 x 10" Sq. Hd. Machine Bolts with Hex. Nuts.	
47				
48				

NOTE:

For switch machine see G.R.S.Co. Catalogue Plate J3101 or J3102.

Approved: ________ Chief Eng'r. Maintenance

Approved: ________ Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD

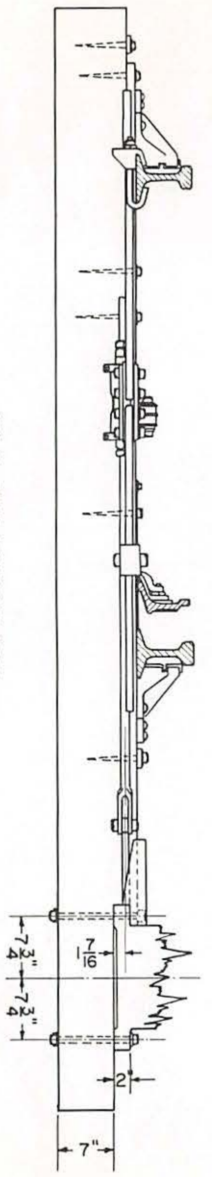
MATERIAL LIST FOR 5A OR 5C SWITCH MACHINE APPLIED TO MOVABLE POINT FROG OF DOUBLE SLIP SWITCH

Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Nov. 14, 1950

Sheet No. 2

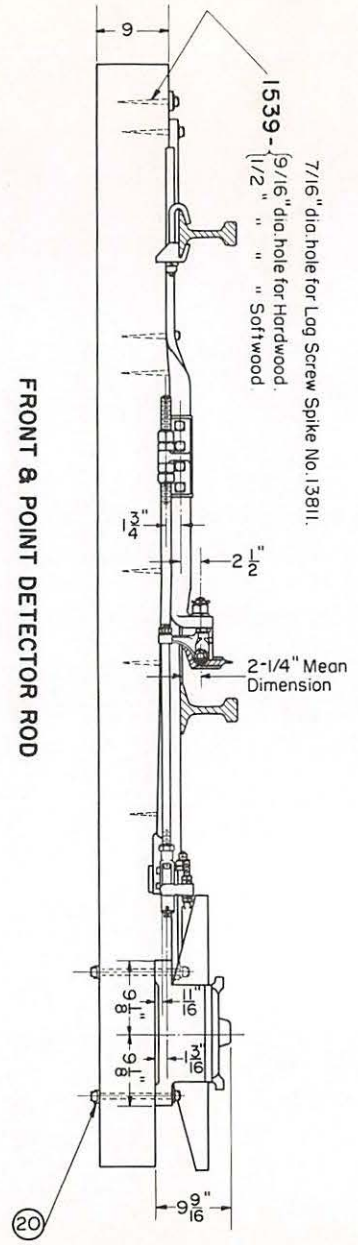
S-217

12-22-50: New Plan Made.
5-16-51: Adopted.
4-2-54: Lag Screw Spike Changed.
5-7-55: Revised.
1-13-59: 1532 rev.



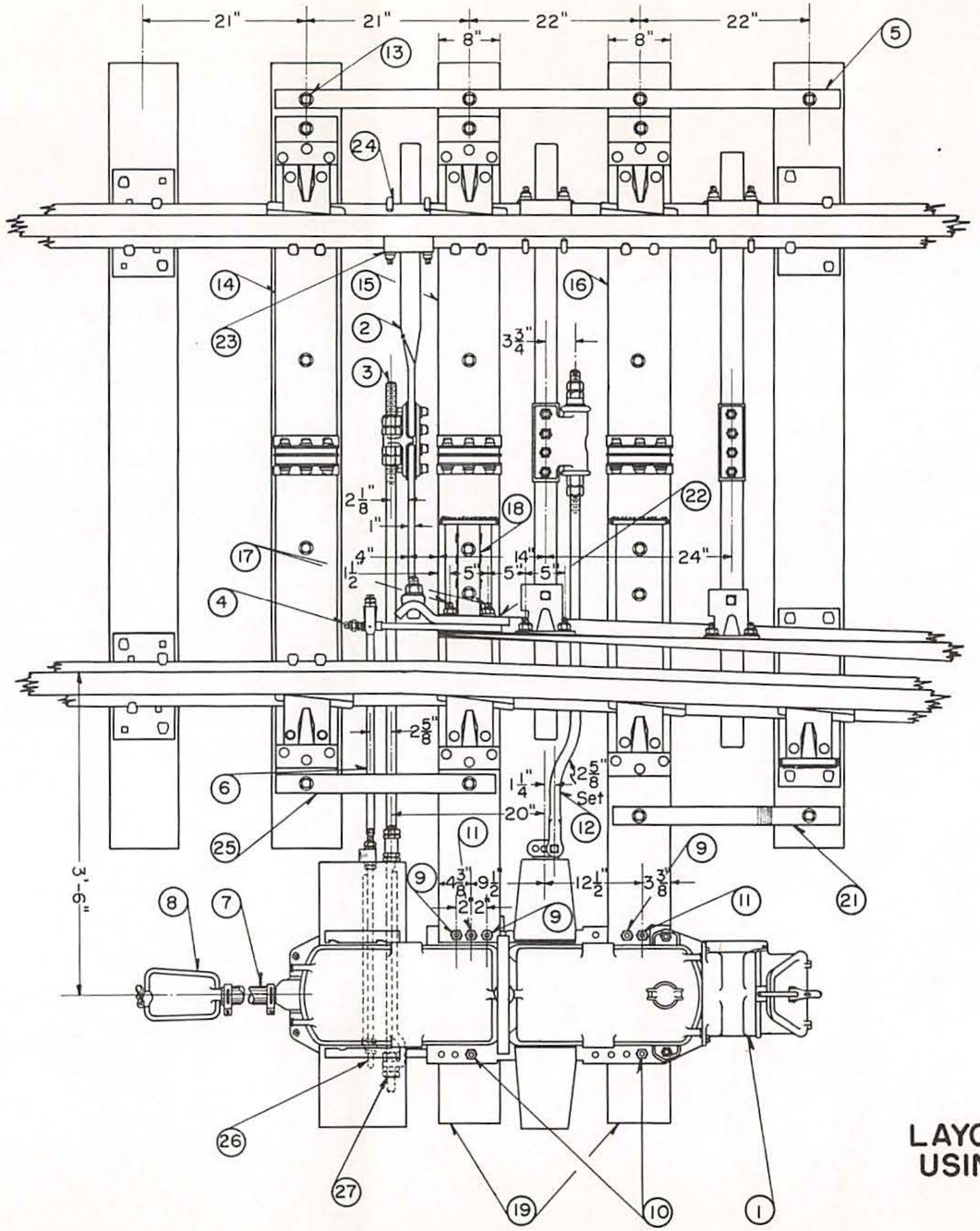
7 3/4"
7 3/4"
1 7/16
2"
7"

NO. 1 AND THROW ROD



9
1539-
7/16" dia. hole for Lag Screw Spike No. 13811.
9/16" dia. hole for Hardwood.
1/2" " " " Softwood.
1 3/4"
2 1/2"
2-1/4" Mean Dimension
9 1/8"
9 1/8"
11/16
1 3/16
9 9/16"
20

FRONT & POINT DETECTOR ROD



21"
21"
22"
22"
8"
8"
1
2
3
3 3/4"
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
2 1/8"
1"
4"
1 1/2
5"
5"
14"
5"
24"
2 5/8"
1 1/4"
2 5/8" Set
20"
4 3/8
9 1/2
2
2
12 1/2"
3 3/8
3'-6"

Approved: Chief Engineer

Approved: A. L. Jordan Signal Engineer

BALTIMORE & OHIO RAILROAD

LAYOUT FOR SPLIT SWITCH DERAIL USING 5A OR 5C SWITCH MACHINE

Office of Signal Engineer
Baltimore, Md.
Jan. 13, 1959

Sheet No. 1

S-218-C

MATERIAL LIST FOR SPLIT SWITCH DERAIL USING 5A OR 5C SWITCH MACHINE

ITEM	NUMBER	REQ'D.	NAME	DRAWING
1		1	Switch Machine (See Note).	
2	2130	1	Swivel Type Front Rod for Split Switch Derail.	S-213
3	1834	1	Lock Rod Connecting Rod.	S-183-D (sh.1)
4	1532	1	Switch Circuit Controller Lug Assembly.	S-153-H (sh.1)
5	1531-3	1	$2\frac{1}{2}$"x$\frac{1}{2}$"x 6'-2" Long Tie Strap.	S-153-H (sh.1)
6	1822	1	Point Detector Connecting Rod Assembly	S-182-B (sh.1)
7	15311	1	Rubber Conduit Assembly.	S-153-H (sh.2)
8	2291	1	16-way Junction Box	S-229-A (sh.1)
9		3	$\frac{3}{4}$" Dia. x $3\frac{1}{4}$" Long Sq. Hd. Hex. Nut Machine Bolts with Spring Washers.	
10		2	$\frac{3}{4}$" Dia. x $11\frac{1}{2}$" " " " " " " " " " "	
11		2	$\frac{3}{4}$" Dia. x $12\frac{1}{2}$" " " " " " " " " " "	
12	1843	1	Operating Rod Assembly.	S-184-D (sh.1)
13	1539	19	Galvanized Drive Spike	S-153-H (sh.2)
14		1	No. 1 Insulated Gauge Plate Assembly. (Shown on Pg. 206 Roadway & Track Std. Book.)	37019
15		1	No. 2 " " " " (Consisting of 1/2 No.1 Plate and 1/2 No.2 Plate.)	37019
16		1	No. 3 " " " " " " " " " " " "	37019
17	1541	2	Front Foot Bolt Assembly.	S-154-F (sh.1)
18	15316	1	Stop Plate.	S-153-H (sh.1)
19	1520	2	8"x 9"x 12'-0" Long Sawed Oak Tie.	S-152-B (sh.1)
20	15320	4	Raco Bolt Grip for 3/4" dia. Bolt (Raco No. 589-1).	S-153-H (sh.3)
21	1531-5	1	$2\frac{1}{2}$"x$\frac{1}{2}$"x 2'-$5\frac{1}{2}$" Long Tie Strap.	S-153-H (sh.1)
22	125512	1	Switch Lug Plate	S-364
23		3	Rod Guide (Shown on Pg. 62 Roadway & Track Standard Book).	35790
24		6	Hook Bolts " " " " " " " " "	35790
25	1531-4	1	$2\frac{1}{2}$"x$\frac{1}{2}$"x 2'-$5\frac{1}{2}$" Long Tie Strap	S-153-H (sh.1)
26	18220	1	Point Detector Rod Assembly	S-182-B (sh.6)
27	18325	1	Adjustable Lock Rod Assembly	S-183-D (sh.3)
28				

NOTE:

When ordering Insulated Gauge Plates specify weight and section of rail Chief Engineer's Drawing No. 37019.

When ordering Hook Bolts specify weight and section of rail. Chief Engineer's Drawing No. 35790.

For Switch Machines see G.R.S. Co. Catalogue Section J, Part 31 and specify whether for Right or Left Hand and Wiring Diagram.

Approved: C. Riley
Chief Engineer

Approved: A. L. Jordan
Signal Engineer

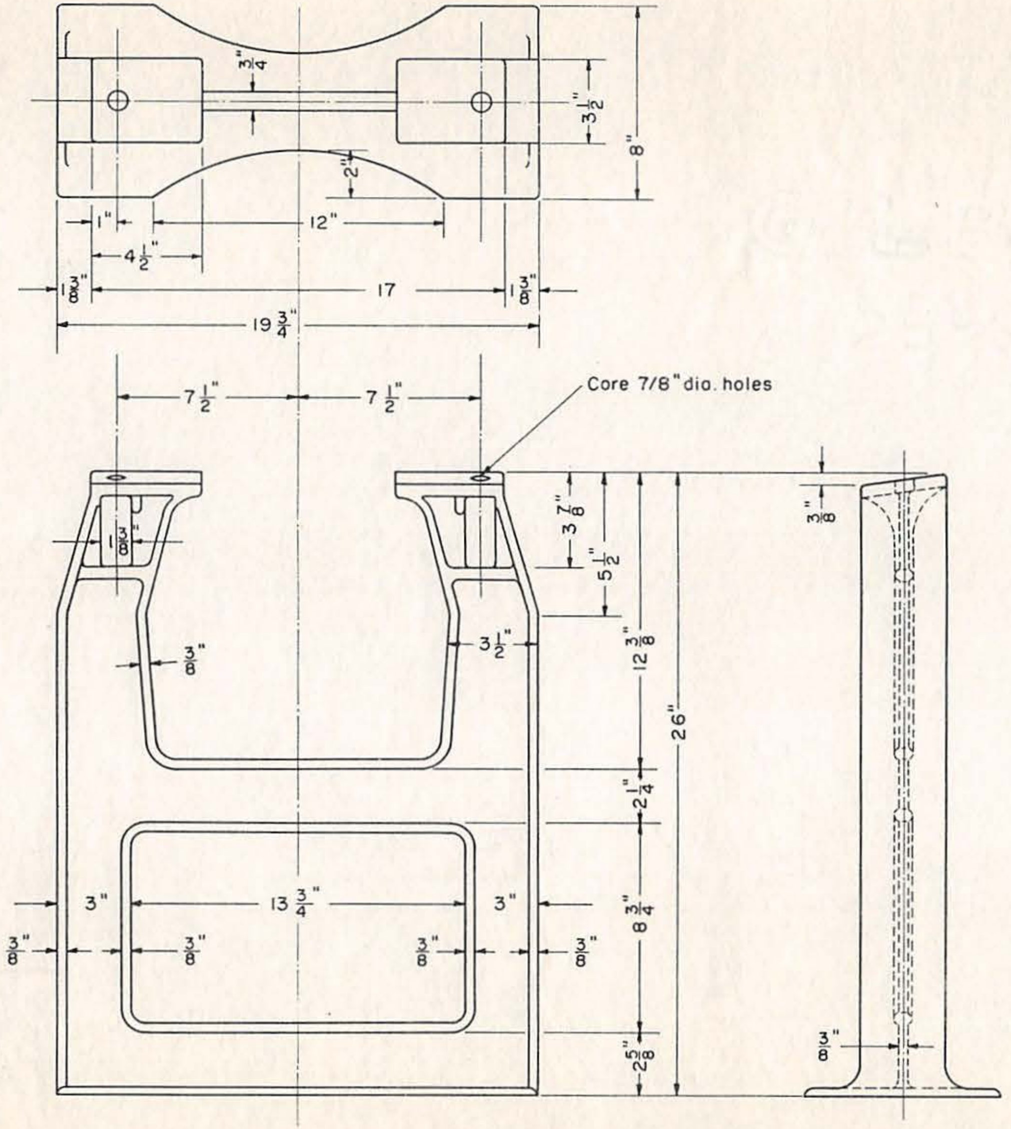
BALTIMORE & OHIO RAILROAD
MATERIAL LIST FOR SPLIT SWITCH DERAIL
USING 5A OR 5C SWITCH MACHINE
Office of Signal Engineer
Baltimore , Md.
Jan. 13 , 1959

12-22-50: New Plan Made.
Adopted: 5-16-51.
Revised: 5-16-55.
Revised: 3-12-57.
1-13-59: 1532 rev.

Sheet No. 2

S-218-C

Adopted: 5-15-51



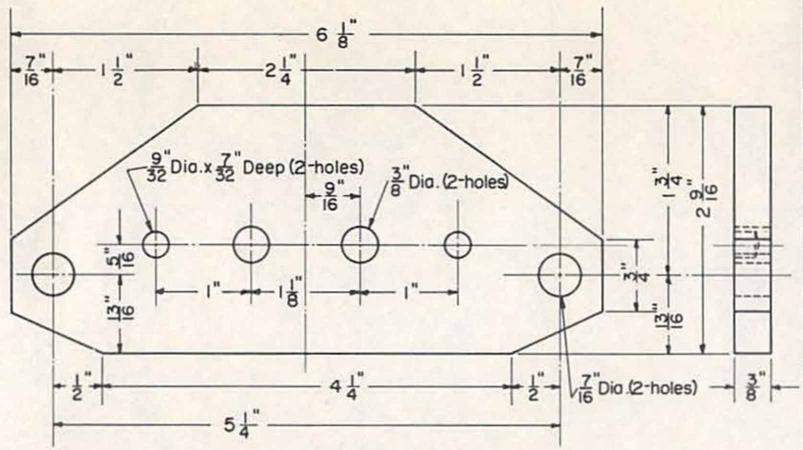
3/4"
3 1/2"
8"
2 1/4"
1"
12"
4 1/2"
1 3/8"
17
1 3/8"
19 3/4"
7 1/2"
7 1/2"
Core 7/8" dia. holes
3/4"
3/8"
3 7/8"
5 1/2"
3/8"
3 1/2"
12 3/8"
26"
2 1/4"
3"
13 3/4"
3"
8 3/4"
3/8"
3/8"
3/8"
3/8"
2 5/8"
3/8"

CAST-IRON FOUNDATION- 2201
(U.S.&S.Co. Pce. 220530.)

Approved: ______ Chief Eng'r. Comm. & Sigs.

BALTIMORE & OHIO RAILROAD
CAST-IRON FOUNDATION
FOR C.P.L. DWARF SIGNAL
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
Jan. 4, 1951

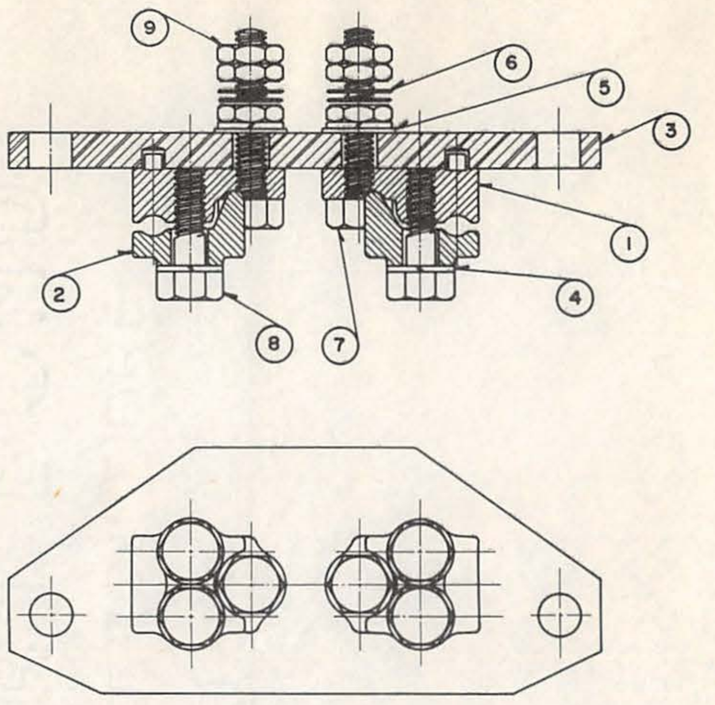
S-220


6 1/8"
7/16" 1 1/2" 2 1/4" 1 1/2" 7/16"
9/32" Dia. x 7/32" Deep (2-holes)
9/16"
3/8" Dia. (2-holes)
5/16"
13/16"
1" 1 1/8" 1"
1 3/4"
2 9/16"
3/4"
13/16"
1/2" 4 1/4" 1/2"
7/16" Dia. (2-holes)
3/8"
5 1/4"

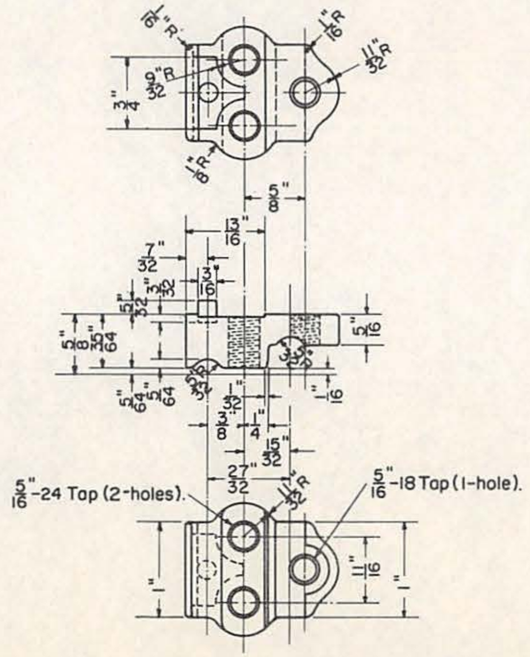
DUPLICATE SHUNT CONNECTION COVER PLATE - **2211**
Ebony Asbestos-Finished Both Sides.

MATERIAL LIST FOR DUPLICATE SHUNT CONNECTION ASSEMBLY-

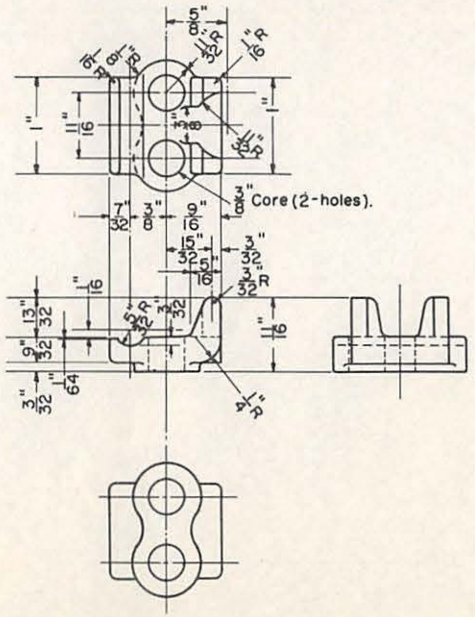
ITEM	NUMBER	REQ'D	NAME	DRAWING
1	2212	2	Connector Clamp Base.	S-221
2	2213	2	Connector Clamp Top Plate.	S-221
3	2211	1	Duplicate Shunt Connection Cover Plate.	S-221
4	99-11	6	5/16" Bronze Spring Washer. Raco	521 (sh.3)
5	164-8	2	5/16" Copper Washer. Raco	521 (sh.3)
6	S.I.1416	4	Copper Bevel Washers N.P (.320" hole for 5/16" Screw.) Raco	521 (sh.3)
7	521-23	2	Bronze 5/16"-18 x 1-3/4" Hex.Hd. Tap Bolt (all thread.) Raco	521 (sh.3)
8	521-38	4	Bronze 5/16"-24 x 1" Springtite Cap Screw. Raco	521 (sh.3)
9	S.I.1415	6	Brass Clamp Nuts N.P. (5/16"-18 Th'ds.) Double Chamfered. Raco	521 (sh.3)



RACO NO. 521-1 DUPLICATE SHUNT CONNECTION ASSEMBLY- **2210**


5/16" R
1/16" R
11/32" R
9/32" R
3/4"
1/8" R
5/8"
13/16"
7/32"
3/16"
5/32"
3/32"
5/8"
35/64"
5/16"
5/64"
5/64"
3/32"
3/8"
1/4"
15/32"
27/32"
5/16"-24 Tap (2-holes).
5/16"-18 Tap (1-hole).
11/16"
1"

CONNECTOR CLAMP BASE - **2212**
Bronze 85-5-5-5 Tinned


5/8"
1/32" R
1/16" R
1"
11/16"
3/8" Core (2-holes).
7/32"
3/8"
9/16"
15/32"
5/16"
3/32"
3/32" R
13/32"
9/32"
3/32"
1/16"
11/16"
1/4" R

CONNECTOR CLAMP TOP PLATE - **2213**
Bronze 85-5-5-5 Tinned

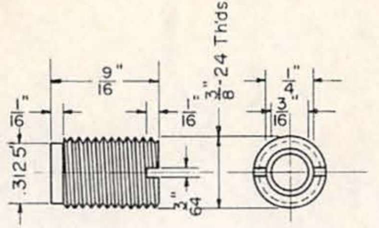
Approved: ______ Chief Eng'r. Maintenance

Approved: ______ Chief Eng'r. Comm. & Sigs.

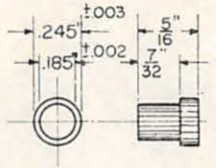
BALTIMORE & OHIO RAILROAD
DUPLICATE SHUNT CONNECTION
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
May 2, 1951

Adopted: 5-16-51.

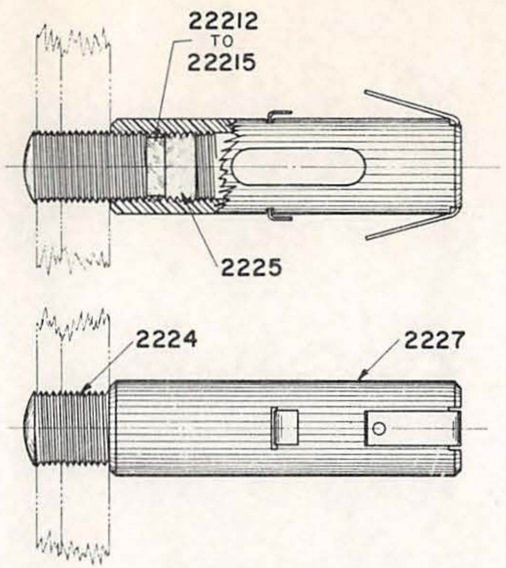
S-221


9/16"
1/4"
1/16"
1/16"
3/8"-24 Th'ds.
3/16"
.3125"
3/64"

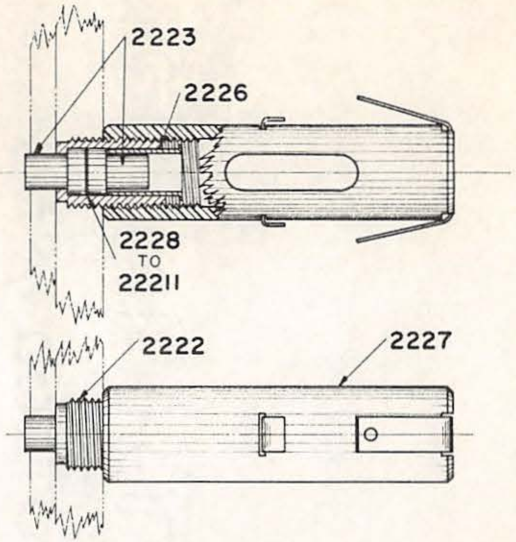
NO. 504-29 RACO LAMP SOCKET - **2222**
Brass


.245" ±.003
.185" ±.002
5/16"
7/32"

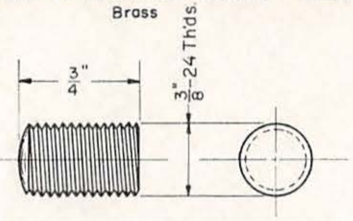
NO. 504-22 RACO LENS - **2223**
Clear Plastic


22212
TO
22215
2225
2224
2227

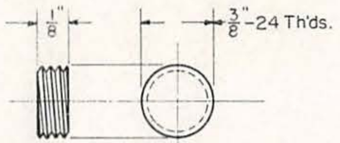
NO. 504-2 RACO TRACK MODEL LAMP RECEPTACLE
ASSEMBLY - **2221**


2223
2226
2228
TO
22211
2222
2227

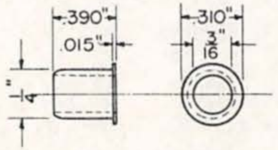
NO. 504-3 RACO TRACK MODEL LAMP RECEPTACLE
ASSEMBLY - **2220**


3/4"
3/8"-24 Th'ds.

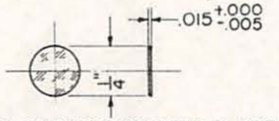
NO. 504-26 RACO LENS - **2224**
Clear Plastic


1/8"
3/8"-24 Th'ds.

NO. 504-27 RACO REAR LENS - **2225**
Clear Plastic

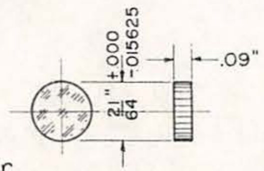

.390"
.015"
1/4"
.310"
3/16"

NO. 504-23 RACO LENS RETAINER - **2226**
Aluminum


.015" +.000 -.005
1/4"

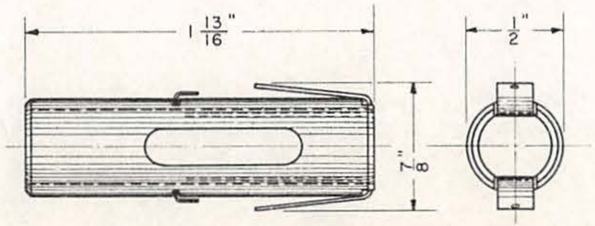
NO. 504-24 RACO COLORED PLASTIC DISC

RED	-**2228**
AMBER	-**2229**
GREEN	-**22210**
BLUE	-**22211**


2 1/64" +.000 -.015625
.09"

NO. 504-30 RACO COLORED GLASS DISC

RED	-**22212**
AMBER	-**22213**
GREEN	-**22214**
BLUE	-**22215**



NO. 504-20 RACO LAMP SOCKET WITH CONTACT SPRINGS
NO. 504-25 - **2227**

Approved: ______
Chief Eng'r. Comm. & Sigs.

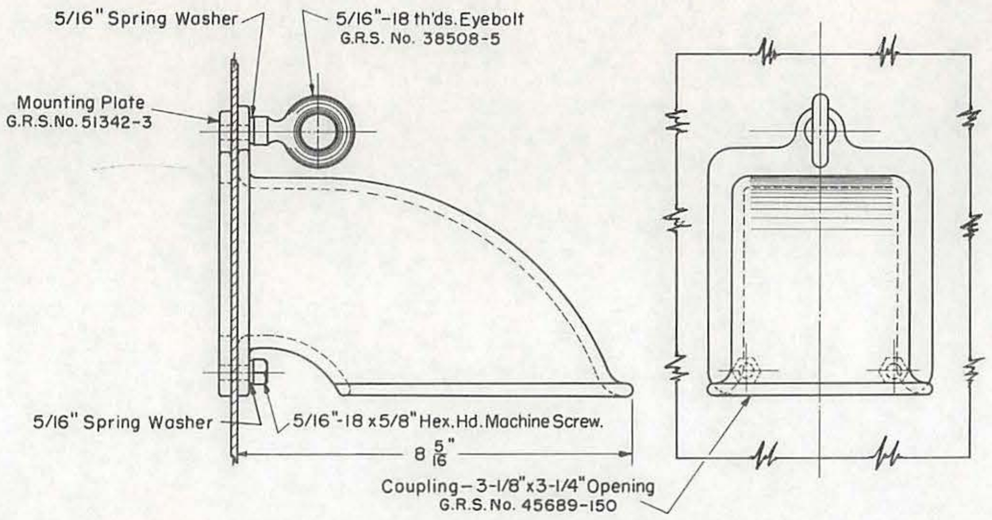
BALTIMORE & OHIO RAILROAD

TRACK MODEL LAMP RECEPTACLE ASSEMBLIES AND DETAILS

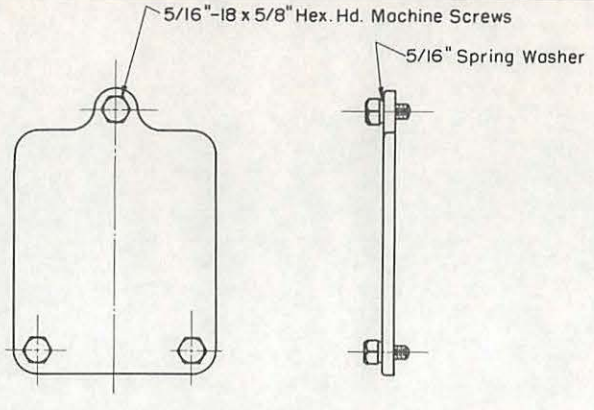
Office of Chief Engineer Comm. & Signals
Baltimore, Md.
May 7, 1951

Adopted: 5-16-4

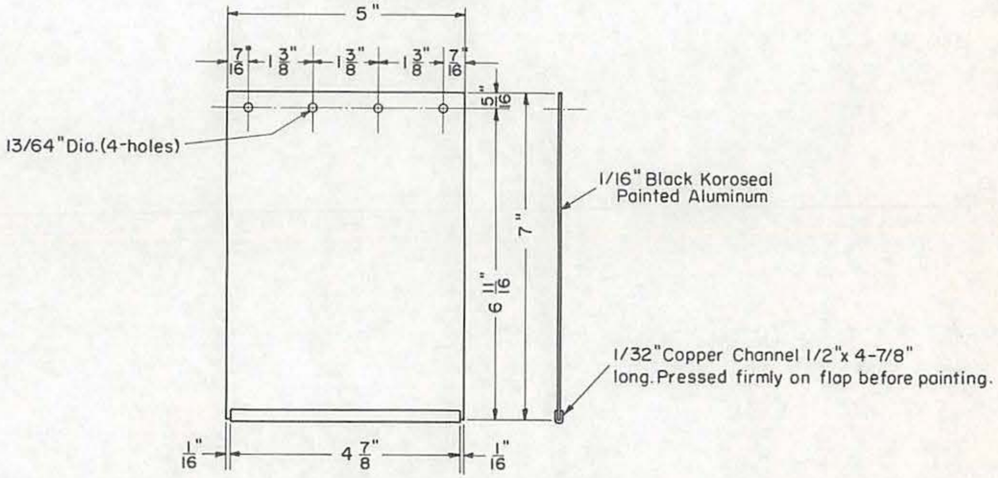
S-222


5/16" Spring Washer
5/16"-18 th'ds. Eyebolt
G.R.S. No. 38508-5
Mounting Plate
G.R.S. No. 51342-3
5/16" Spring Washer
5/16"-18 x 5/8" Hex. Hd. Machine Screw.
8 5/16"
Coupling-3-1/8"x3-1/4" Opening
G.R.S. No. 45689-150

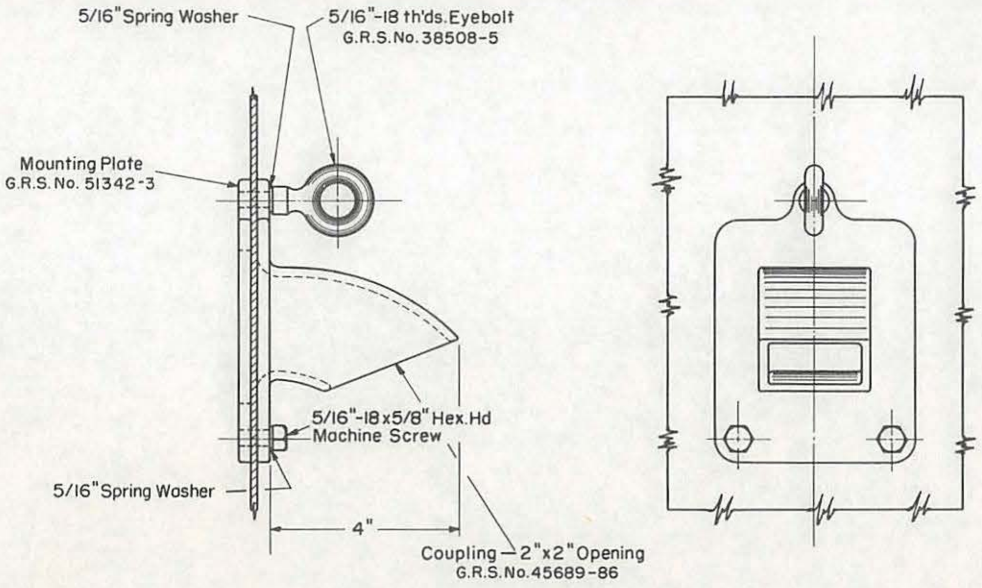
LARGE CABLE ENTRANCE ASSEMBLY -**2232**


5/16"-18 x 5/8" Hex. Hd. Machine Screws
5/16" Spring Washer

COVER PLATE - **2234**
G.R.S. No. 51342-2


5"
7/16"
1 3/8"
1 3/8"
1 3/8"
7/16"
5/16"
13/64" Dia. (4-holes)
7"
6 11/16"
1/16" Black Koroseal
Painted Aluminum
1/32" Copper Channel 1/2" x 4-7/8"
long. Pressed firmly on flap before painting.
1/16"
4 7/8"
1/16"

LOCK PROTECTION FLAP - **2233**


5/16" Spring Washer
5/16"-18 th'ds. Eyebolt
G.R.S. No. 38508-5
Mounting Plate
G.R.S. No. 51342-3
5/16"-18 x 5/8" Hex. Hd
Machine Screw
5/16" Spring Washer
4"
Coupling—2"x2" Opening
G.R.S. No. 45689-86

SMALL CABLE ENTRANCE ASSEMBLY -**2231**

Approved; A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
FITTINGS FOR STEEL RELAY HOUSINGS
Office of Signal Engineer
Baltimore, Md.
Dec. 4, 1958

S-223-A

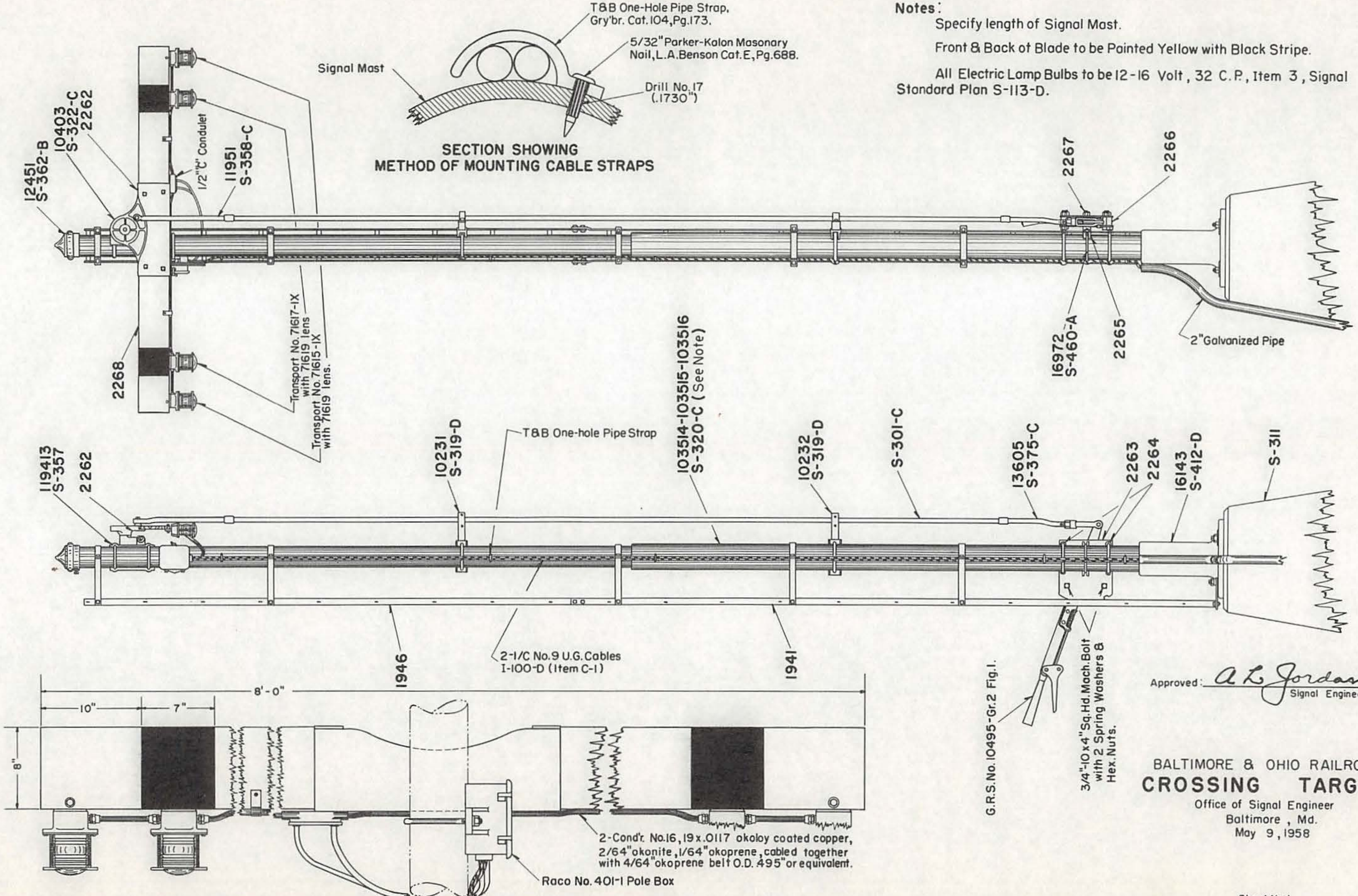
Made & Corrected 3-5-52
Adopted 11-18-52

Notes:

Specify length of Signal Mast.

Front & Back of Blade to be Painted Yellow with Black Stripe.

All Electric Lamp Bulbs to be 12-16 Volt, 32 C.P., Item 3, Signal Standard Plan S-113-D.


T&B One-Hole Pipe Strap, Gry'br. Cat. 104, Pg. 173.
5/32" Parker-Kalon Masonary Nail, L.A. Benson Cat. E, Pg. 688.
Signal Mast
Drill No. 17 (.1730")
SECTION SHOWING METHOD OF MOUNTING CABLE STRAPS
12451 S-362-B
10403 S-322-C 2262
1/2" "C" Condulet
11951 S-358-C
2267
2266
2268
Transport No. 71617-1X with 71619 lens
Transport No. 71615-1X with 71619 lens.
16972 S-460-A
2265
2" Galvanized Pipe
103514-103515-103516 S-320-C (See Note)
19413 S-357
2262
10231 S-319-D
T&B One-hole Pipe Strap
10232 S-319-D
S-301-C
13605 S-375-C
2263
2264
16143 S-412-D
S-311
1946
2-1/C No. 9 U.G. Cables I-100-D (Item C-1)
1941
G.R.S. No. 10495-Gr. 2 Fig. 1.
3/4"-10 x 4" Sq. Hd. Mach. Bolt with 2 Spring Washers & Hex. Nuts.
8'-0"
10"
7"
8"
2-Cond'r. No. 16, 19 x .0117 okoloy coated copper, 2/64" okonite, 1/64" okoprene, cabled together with 4/64" okoprene belt O.D. .495" or equivalent.
Raco No. 401-1 Pole Box

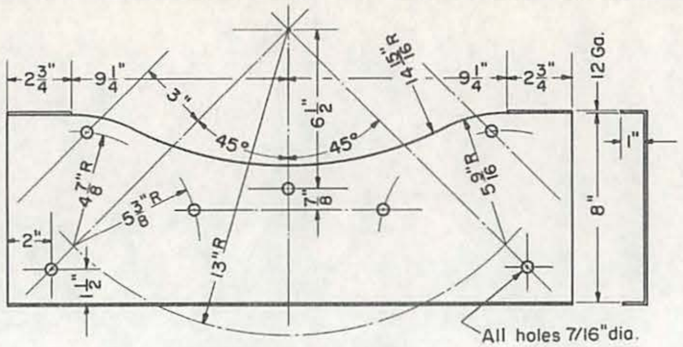
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CROSSING TARGET
Office of Signal Engineer
Baltimore, Md.
May 9, 1958

Sheet No. 1

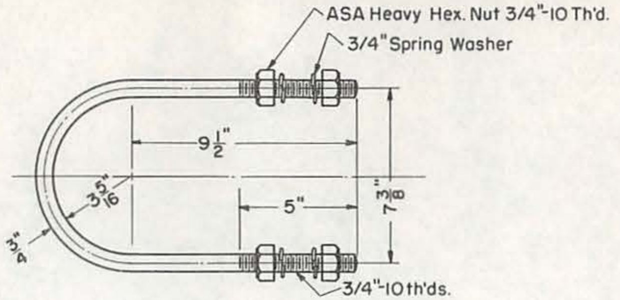
S-226-A

Made & Corrected 7-28-53
Adopted: 1-12-54.
Revised: 5-9-58: WRRS gate lamp 1585 changed
to T.P.C. gate lamp 71615-1X and 71617-1X



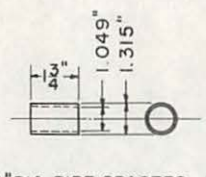
2 3/4"
9 1/4"
3"
14 15/16" R
9 1/4"
2 3/4"
12 Ga.
6 1/2"
45°
45°
1"
4 7/8" R
5 3/8" R
7/8"
5 9/16" R
8"
2"
13" R
1 1/2"
All holes 7/16" dia.

BACK GRIP PLATE – **2261**



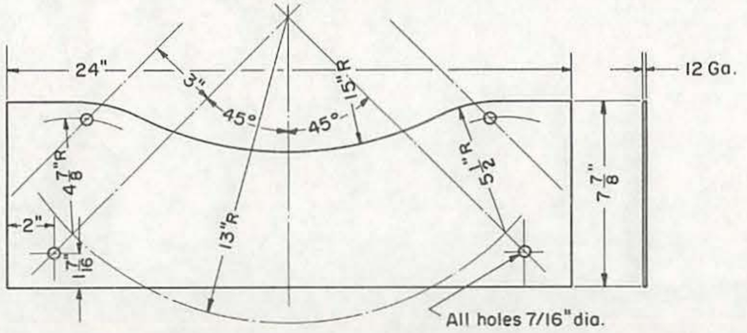
ASA Heavy Hex. Nut 3/4"-10 Th'd.
3/4" Spring Washer
9 1/2"
3 5/16"
5"
7 3/8"
3/4"
3/4"-10 th'ds.

" U " BOLT CLAMP – **2264**
2-Req'd.



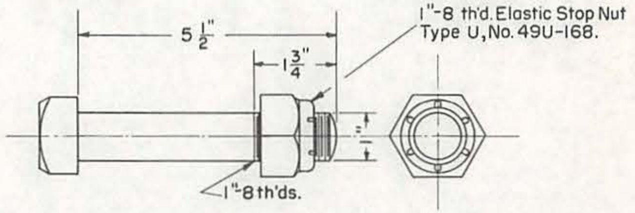
1 3/4"
1.049"
1.315"

1" DIA. PIPE SPACERS – **2266**
6-Req'd.



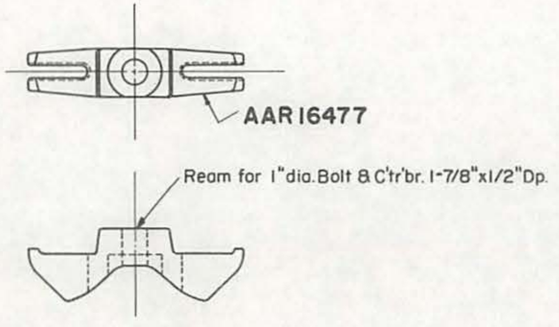
24"
3"
15" R
12 Ga.
45°
45°
4 7/8" R
5 1/2" R
7 7/8"
2"
13" R
1 7/16"
All holes 7/16" dia.

FRONT GRIP PLATE – **2262**



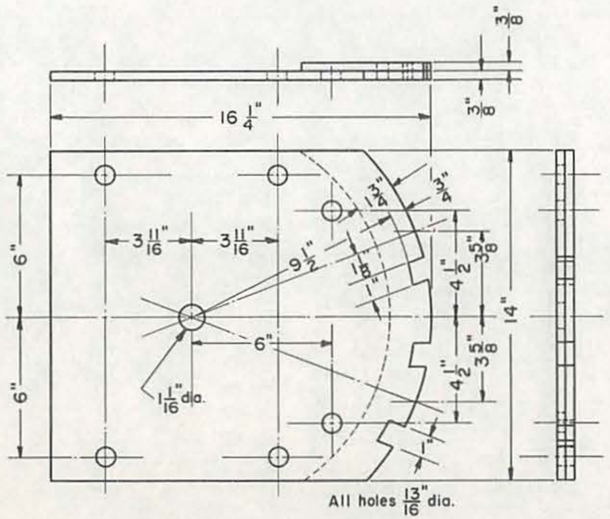
5 1/2"
1 3/4"
1"-8 th'd. Elastic Stop Nut
Type U, No. 49U-168.
1"
1"-8 th'ds.

LEVER PIN BOLT – **2267**



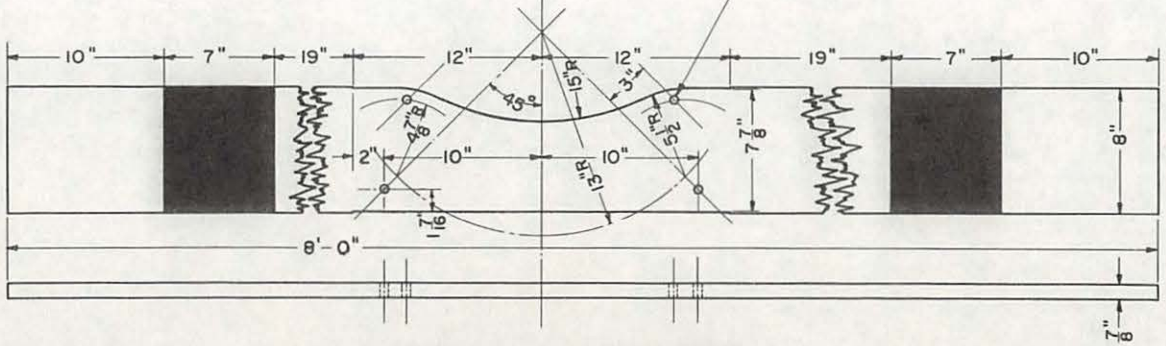
AAR 16477
Ream for 1" dia. Bolt & C'tr'br. 1-7/8" x 1/2" Dp.

ADAPTER CLAMP – **2265**



3/8"
3/8"
16 1/4"
3 3/4"
3 3/4"
3 11/16"
3 11/16"
9 1/2"
1 1/2"
4 1/2"
3 5/8"
6"
6"
6"
14"
1 11/16" dia.
4 1/2"
3 5/8"
1"
All holes 13/16" dia.

1-Req'd. as shown – **2263**
1-Req'd. opposite hand



All holes 7/16" Dia.
10"
7"
19"
12"
12"
19"
7"
10"
15" R
3"
45°
4 7/8" R
5 1/2" R
7 7/8"
8"
2"
10"
10"
13" R
1 7/16"
8'-0"
7/8"

WOOD CROSSING TARGET BLADE – **2268**
Front & Back of Blade Yellow with Black Stripe

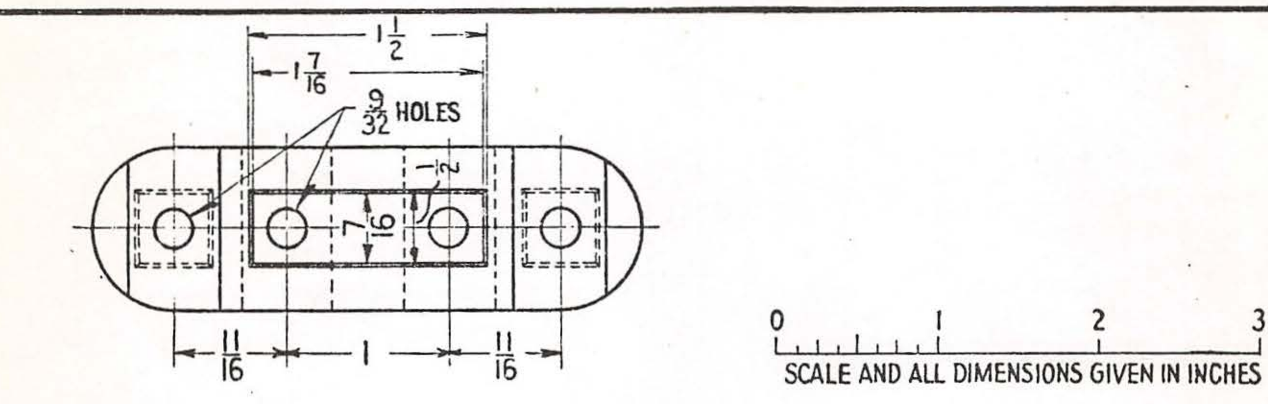
Approved: A L Jordan
Signal Engineer

BALTIMORE & OHIO RAILROAD
CROSSING TARGET
Office of Signal Engineer
Baltimore, Md.
May 9, 1958

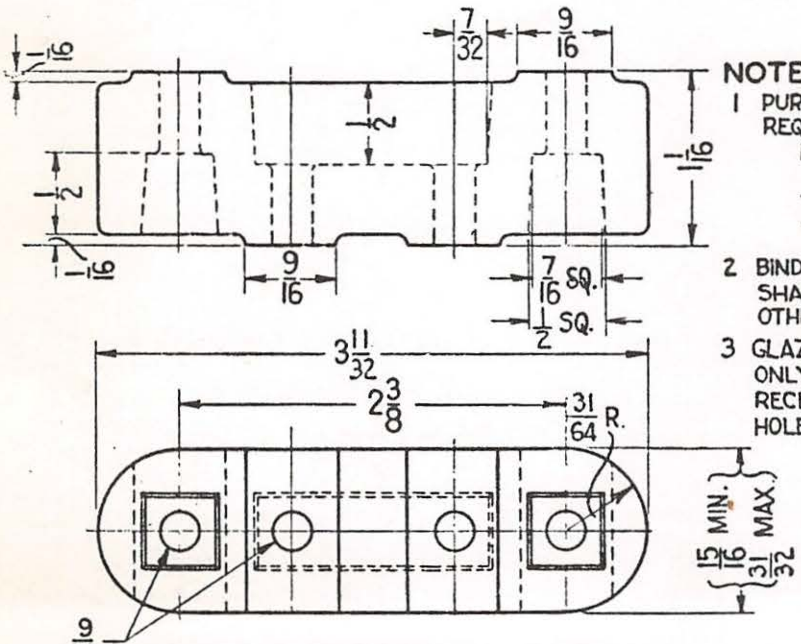
Sheet No. 2

S-226-A

Made & Corrected 7-28-53
Adopted 1-12-54
Revised 5-9-58


1 1/2
1 7/16
9/32 HOLES
1/2
7/16
11/16
1
11/16
0
1
2
3

SCALE AND ALL DIMENSIONS GIVEN IN INCHES


1/16
7/32
9/16
1/2
1/2
1 1/16
1/16
9/16
7/16 SQ.
1/2 SQ.
3 11/32
2 3/8
31/64 R.
15/16 MIN.
31/32 MAX.
9/32

NOTES:

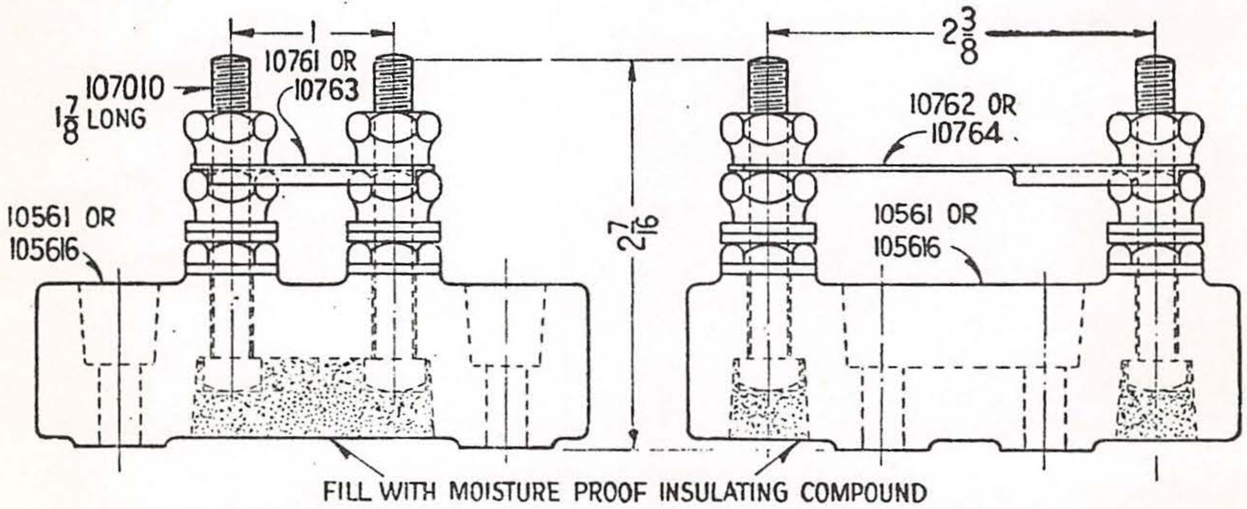
1 PURCHASER TO SPECIFY FOLLOWING REQUIREMENTS ON ORDER:
BINDING POST TYPE AND CLASS OF METAL ALLOY.
TYPE OF PORCELAIN.
TYPE OF CONNECTOR.

2 BINDING NUTS, TWO WASHERS AND CONNECTOR SHALL BE FURNISHED UNASSEMBLED UNLESS OTHERWISE SPECIFIED.

3 GLAZED BASE TO BE GLAZED ON SIDES AND ENDS ONLY. TOP AND BOTTOM SURFACES INCLUDING RECESSES UNGLAZED. GLAZING SHALL NOT ENTER HOLES OR IN ANY WAY DECREASE DIAMETERS.

10561 GLAZED PORCELAIN BASE
(REVERSIBLE)

105616 GRAY UNGLAZED PORCELAIN BASE
(REVERSIBLE)


1
107010
1 7/8 LONG
10761 OR
10763
10561 OR
105616
2 7/16
2 3/8
10762 OR
10764
10561 OR
105616
FILL WITH MOISTURE PROOF INSULATING COMPOUND

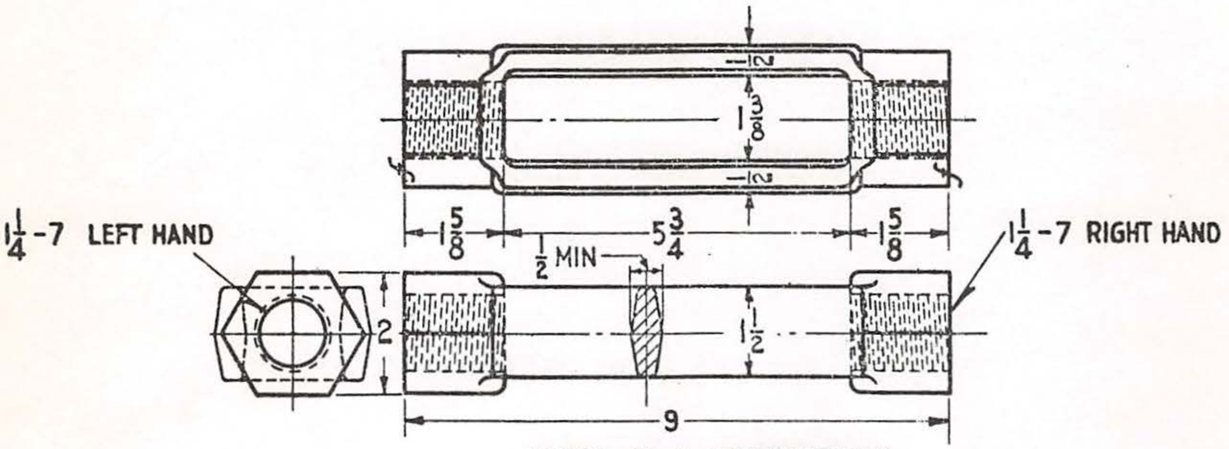
105614 ASSEMBLY

105615 ASSEMBLY

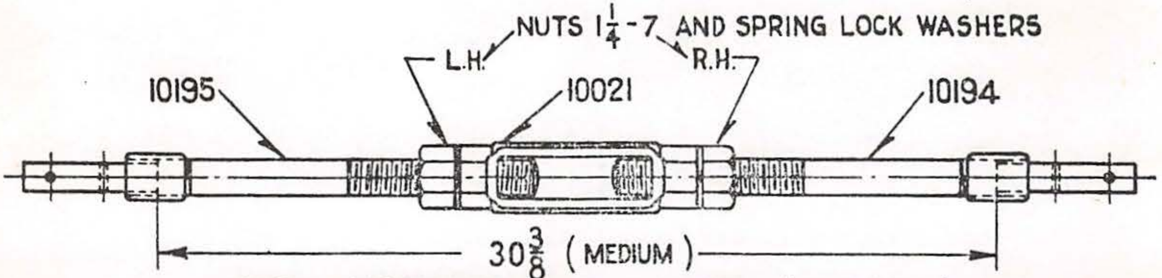
TERMINAL BLOCKS
SHORT TYPE - DETAILS AND ASSEMBLIES

							M-1957	SEP.1957	M-1949	SEP.1949	M-1941	AAR SIG. SEC. 1056G
SEP.1941	M-1934	MAR.1934	M-1929	SEPT.1928	MAN'L 1925	MAR.1924	NOV.1923	M-10-1916	MAY 1915	M-1-1914	MAR.1912	

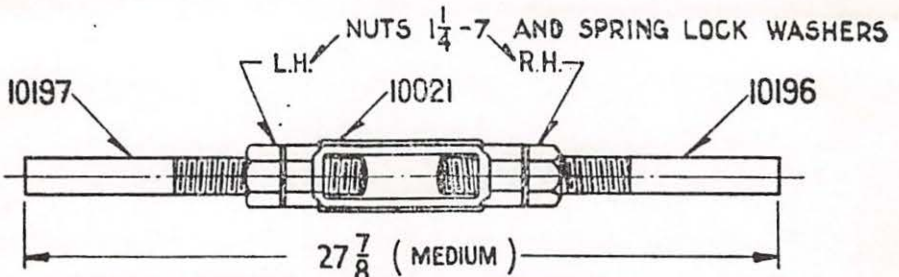
Porcelain shall be in accordance with Specification 144, Manual Part 80. Insulating compound shall be in accordance with Specification 184, Manual Part 73.


$1\frac{1}{4}$-7 LEFT HAND
$\frac{1}{2}$
$1\frac{3}{8}$
$\frac{1}{2}$
$1\frac{5}{8}$
$5\frac{3}{4}$
$1\frac{5}{8}$
$1\frac{1}{4}$-7 RIGHT HAND
$\frac{1}{2}$ MIN
2
$1\frac{1}{2}$
9

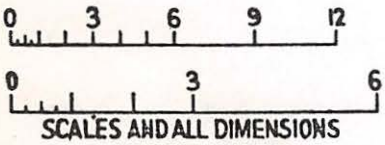
10021 P. A. TURNBUCKLE
STEEL FORGED


NUTS $1\frac{1}{4}$-7 AND SPRING LOCK WASHERS
L.H.
R.H.
10195
10021
10194
$30\frac{3}{8}$ (MEDIUM)

10022 ASSEMBLY OF P. A. SCREW (TANG ENDS)


NUTS $1\frac{1}{4}$-7 AND SPRING LOCK WASHERS
L.H.
R.H.
10197
10021
10196
$27\frac{7}{8}$ (MEDIUM)

10023 ASSEMBLY OF P. A. SCREW (PLAIN ENDS)



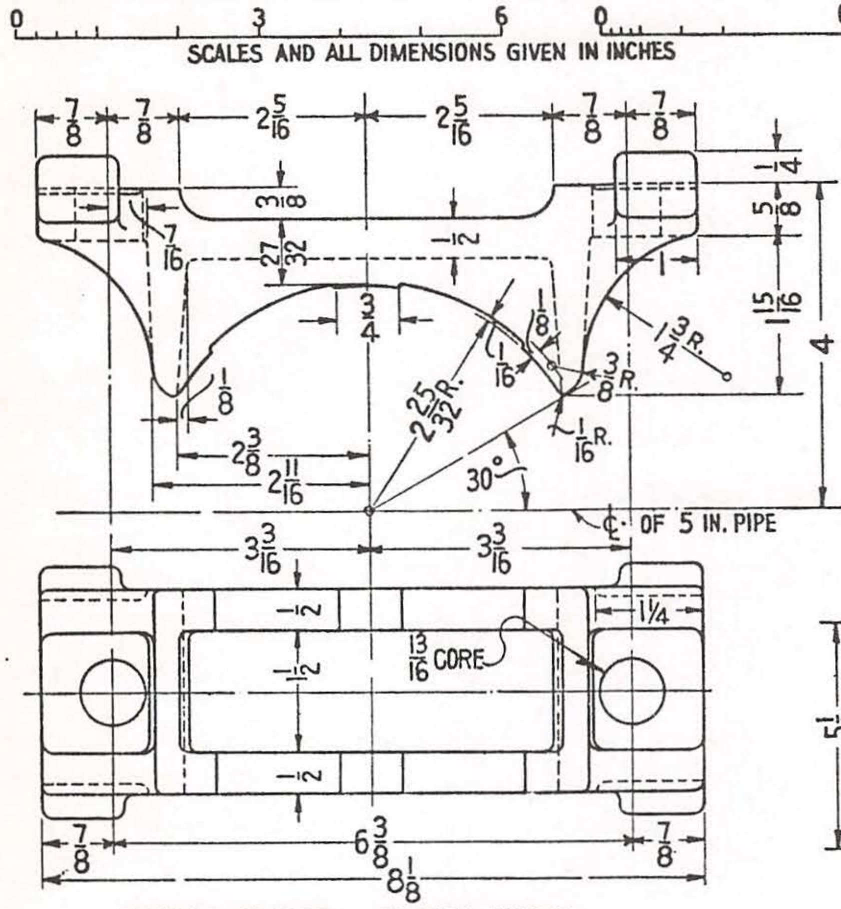
SCALES AND ALL DIMENSIONS
GIVEN IN INCHES

PIPE ADJUSTING SCREWS
DETAILS AND ASSEMBLIES

AAR
SIG. SEC.
1002C

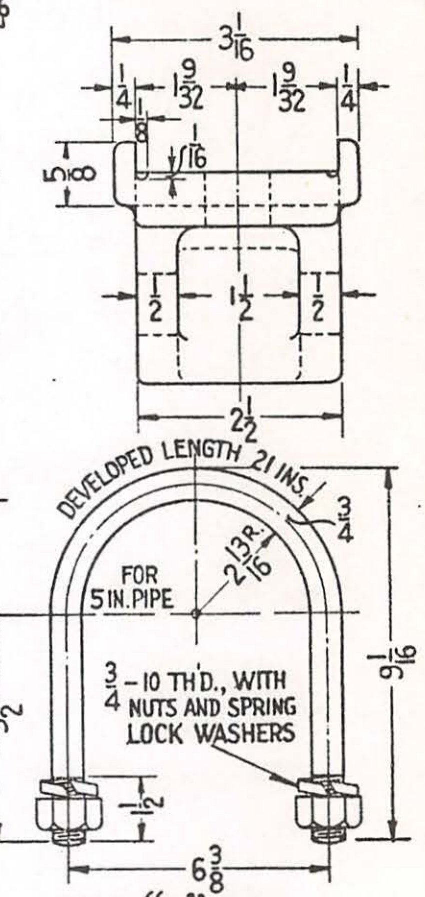
M-1955 | OCT. 1955 | M-1940 | OCT. 1940 | MANUAL-FEB. 1914 | DEC. 1906

Steel shall be in accordance with Specifications for Various Types of Steel, Manual Part 154, section 1. Nuts and threads shall be in accordance with Specifications for Bolts, Nuts and Threads, Manual Part 17. Spring lock washers shall be in accordance with Specifications for Plain and Spring Lock Washers, Manual Part 35. Painting shall be in accordance with Specification 120, Manual Part 110.



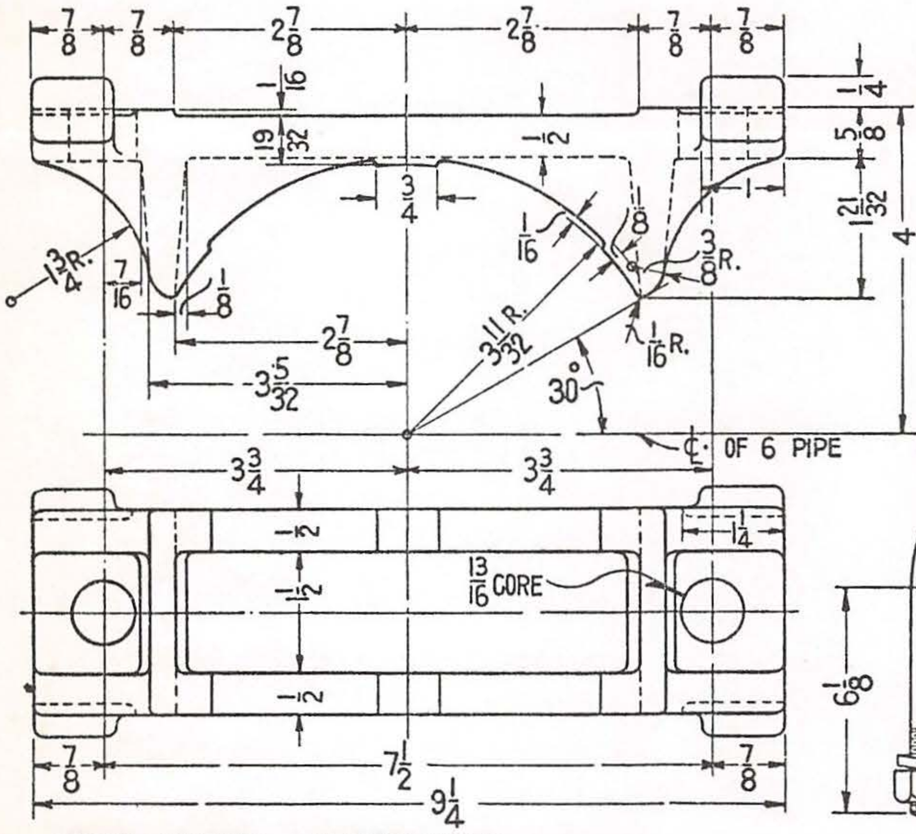
0 3 6 0 6
SCALES AND ALL DIMENSIONS GIVEN IN INCHES
7/8
7/8
2 5/16
2 5/16
7/8
7/8
1/4
5/8
3/8
7/16
27/32
1/2
1
1 15/16
4
3/4
1/8
1/16
1 3/4 R.
3/8 R.
1/8
2 25/32 R.
1/16 R.
2 3/8
2 11/16
30°
℄ OF 5 IN. PIPE
3 3/16
3 3/16
1/2
1 1/2
1/2
13/16 CORE
1 1/4
7/8
6 3/8
7/8
8 1/8

10211 CLAMP – FRONT HALF
CAST IRON



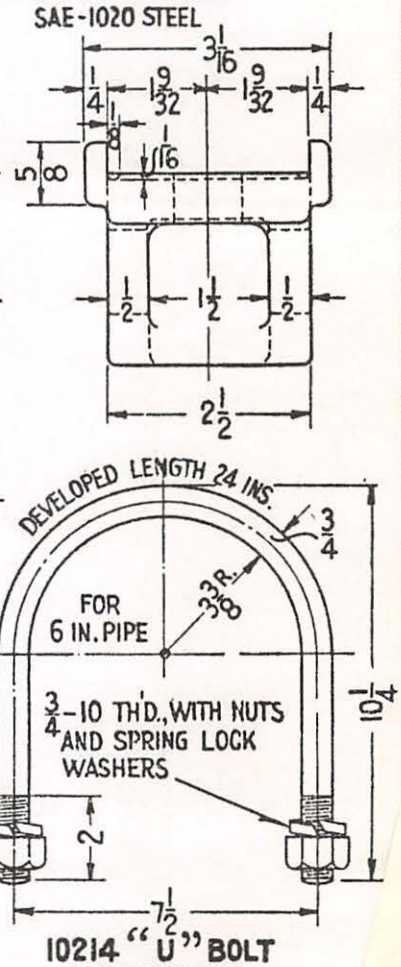
3 1/16
1/4
1 9/32
1 9/32
1/4
1/8
1/16
5/8
1/2
1 1/2
1/2
2 1/2
DEVELOPED LENGTH 21 INS.
3/4
FOR 5 IN. PIPE
2 13/16 R.
9 1/16
5 1/2
3/4 – 10 TH'D., WITH NUTS AND SPRING LOCK WASHERS
1 1/2
6 3/8

10212 "U" BOLT
SAE-1020 STEEL



7/8
7/8
2 7/8
2 7/8
7/8
7/8
1/16
1/4
5/8
19/32
1/2
1
1 21/32
4
3/4
1/16
1/8
1 3/4 R.
7/16
1/8
3/8 R.
3 11/32 R.
1/16 R.
2 7/8
3 5/32
30°
℄ OF 6 PIPE
3 3/4
3 3/4
1/2
1 1/2
1/2
13/16 CORE
1 1/4
7/8
7 1/2
7/8
9 1/4

10213 CLAMP – FRONT HALF, CAST IRON



3 1/16
1/4
1 9/32
1 9/32
1/4
1/8
1/16
5/8
1/2
1 1/2
1/2
2 1/2
DEVELOPED LENGTH 24 INS.
3/4
FOR 6 IN. PIPE
3 3/8 R.
10 1/4
6 1/8
3/4 – 10 TH'D., WITH NUTS AND SPRING LOCK WASHERS
2
7 1/2

10214 "U" BOLT
SAE – 1020 STEEL

NOTE: BOLTS SHALL BE PAINTED WITH PRIMING COAT OR GALVANIZED OR CADMIUM PLATED. NUTS SHALL BE GALVANIZED OR CADMIUM PLATED. GALVANIZING OR CADMIUM PLATING SHALL BE DONE AFTER THREADS HAVE BEEN CUT AND BOLTS FORMED.

GUIDE CLAMPS FOR VERTICAL CONNECTIONS ON SIGNALS

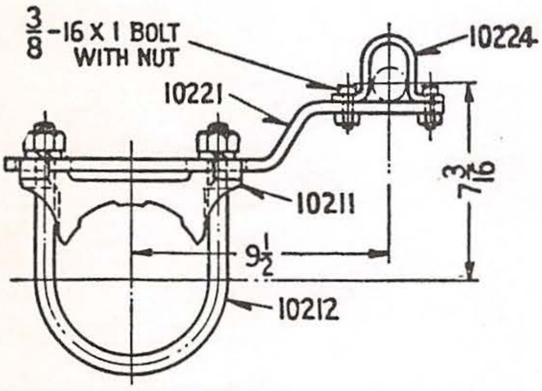
DETAILS

A
SI
I

						M-1947	SEP. 1947	M-1945	OCT. 1945	JUN. 1917	MAR. 1915

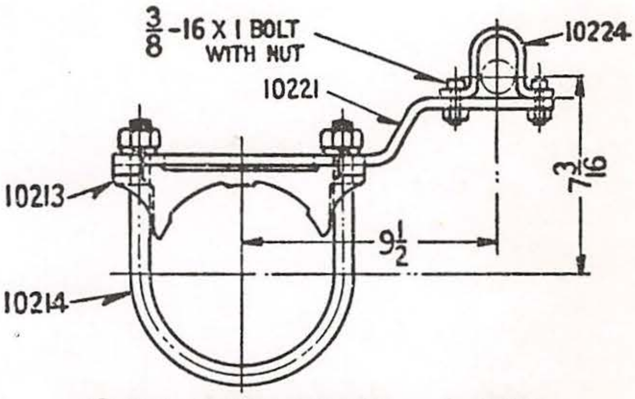
Cast iron shall be in accordance with Specification for Gray Iron Castings, Manual Par
Bolts, nuts and threads shall be in accordance with Specification for Bolts, Nuts and Thr
Manual Part 17; Painting shall be in accordance with Specification 120, Manual Part
Spring Lock Washers shall be carbon steel. (A.S.A. current Specification B27.1 is pref
where practicable.)

S-310-C



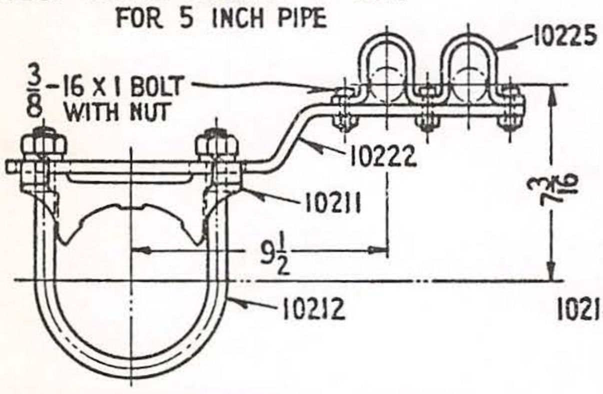
3/8-16 X 1 BOLT WITH NUT
10224
10221
10211
9 1/2
7 3/16
10212

10231 GUIDE COMPL. 1-WAY
FOR 5 INCH PIPE



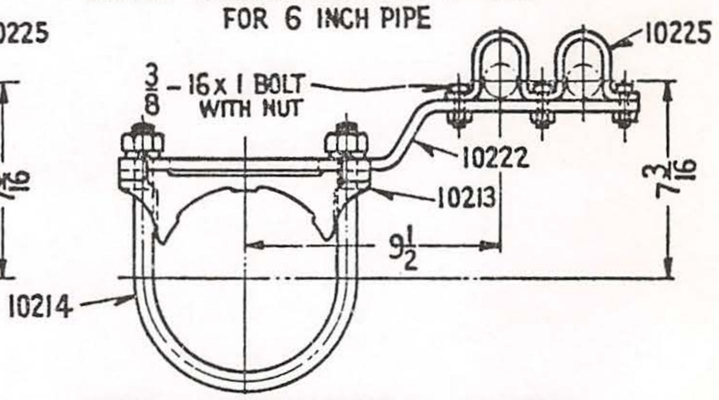
3/8-16 X 1 BOLT WITH NUT
10224
10221
10213
9 1/2
7 3/16
10214

10232 GUIDE COMPL. 1-WAY
FOR 6 INCH PIPE



10225
3/8-16 X 1 BOLT WITH NUT
10222
10211
9 1/2
7 3/16
10212

10233 GUIDE COMPL. 2-WAY
10234 GUIDE COMPL. WITH 1-WAY CAP 10224
FOR 5 INCH PIPE

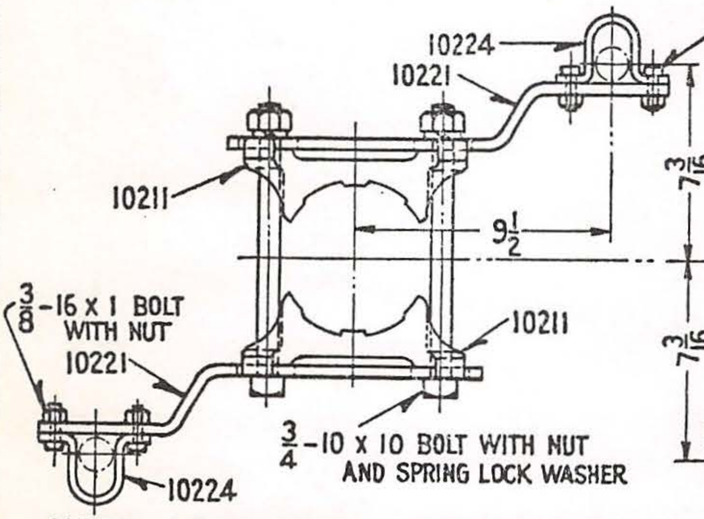


10225
3/8-16 x 1 BOLT WITH NUT
10222
10213
9 1/2
7 3/16
10214

10235 GUIDE COMPL. 2-WAY
10236 GUIDE COMPL. WITH 1-WAY CAP 10224
FOR 6 INCH PIPE

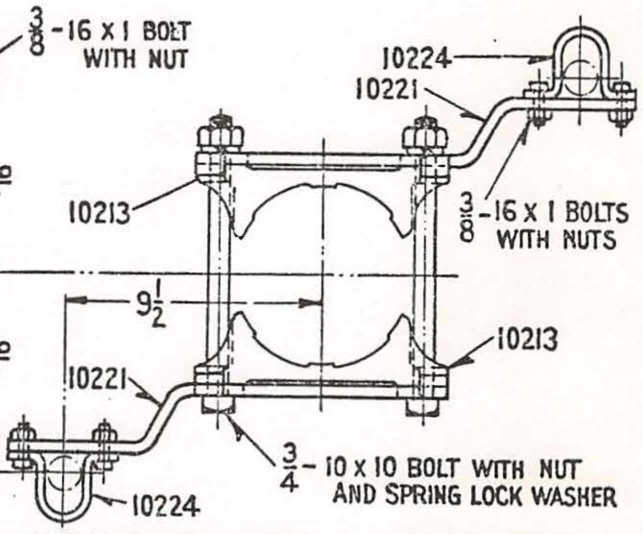
STRAIGHT BOLTS AND NUTS SHALL BE
GALVANIZED OR CADMIUM PLATED
AFTER THREADS HAVE BEEN CUT.

0 3 6 9 12
SCALE AND ALL DIMENSIONS GIVEN IN INCHES



10224
3/8-16 X 1 BOLT WITH NUT
10221
10211
9 1/2
7 3/16
7 3/16
3/8-16 X 1 BOLT WITH NUT
10221
10211
3/4-10 X 10 BOLT WITH NUT AND SPRING LOCK WASHER
10224

102313 GUIDE COMPL. DOUBLE 1-WAY
FOR 5 INCH PIPE



10224
10221
10213
3/8-16 X 1 BOLTS WITH NUTS
9 1/2
10213
10221
3/4-10 X 10 BOLT WITH NUT AND SPRING LOCK WASHER
10224

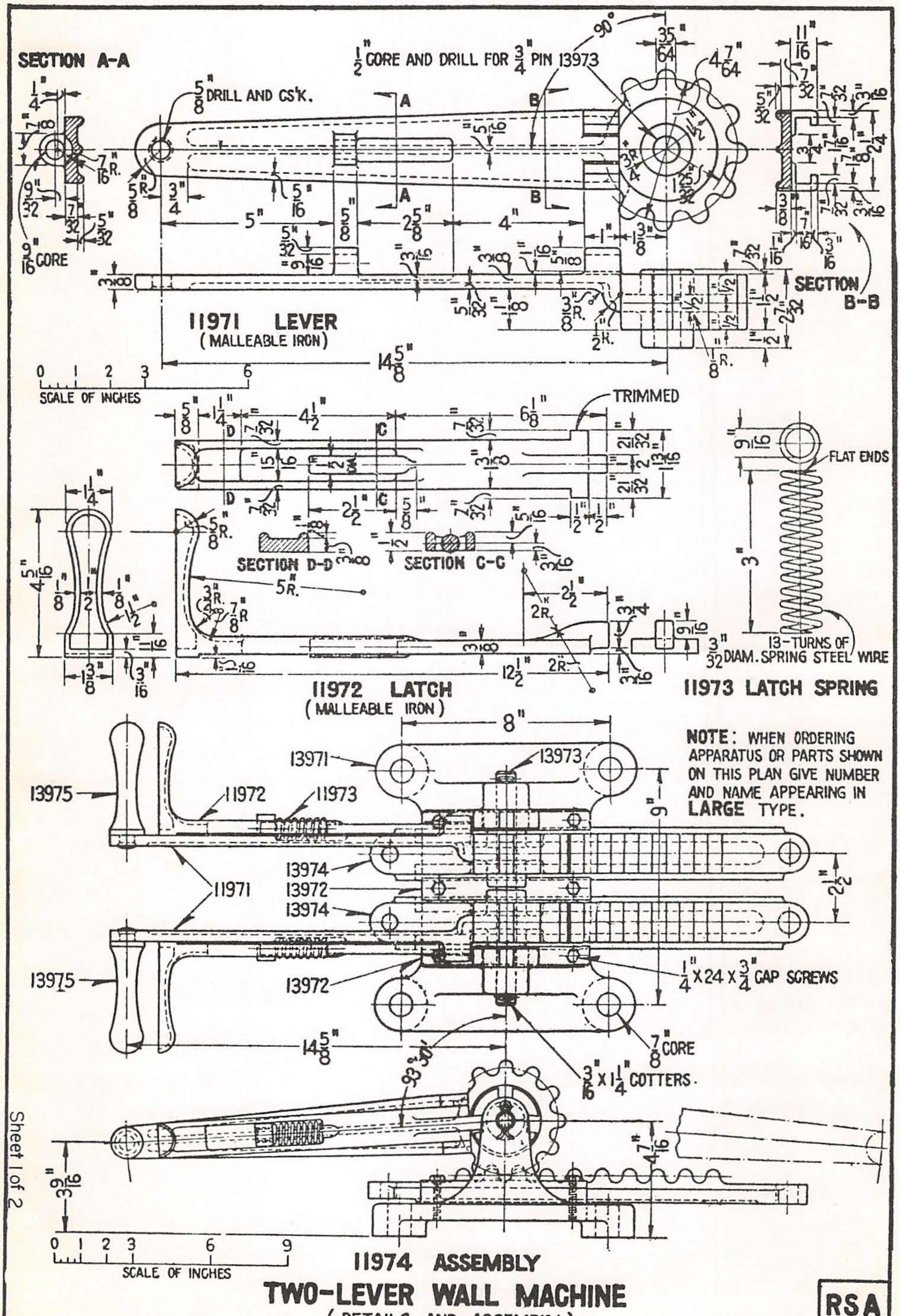
102315 GUIDE COMPL. DOUBLE 1-WAY
FOR 6 INCH PIPE

GUIDES FOR VERTICAL MECHANICAL CONNECTIONS
FOR 5 AND 6 INCH MASTS — ASSEMBLIES

AAR
SIG. SEC.
1023D

M-1948 SEP. 1948 M-1945 OCT. 1945 M-1935 MAR. 1935 MAR. 1915

Spring lock washers shall be carbon steel (A.S.A. current Specification B27.1 is preferred, where practicable). Bolts, nuts and threads shall be in accordance with Specification for Bolts, Nuts and Threads, Manual Part 17.


SECTION A-A
1/2" CORE AND DRILL FOR 3/4" PIN 13973
5/8" DRILL AND CS'K.
9/16" CORE
11971 LEVER
(MALLEABLE IRON)
SECTION B-B
14 5/8"
SCALE OF INCHES
TRIMMED
SECTION D-D
SECTION C-C
11972 LATCH
(MALLEABLE IRON)
FLAT ENDS
13-TURNS OF 3/32" DIAM. SPRING STEEL WIRE
11973 LATCH SPRING
13971
13973
13975
11972
11973
13974
13972
11971
1/4" X 24 X 3/4" GAP SCREWS
7/8" CORE
3/16" X 1 1/4" COTTERS.
93° 30'
11974 ASSEMBLY

NOTE: WHEN ORDERING APPARATUS OR PARTS SHOWN ON THIS PLAN GIVE NUMBER AND NAME APPEARING IN **LARGE** TYPE.

TWO-LEVER WALL MACHINE

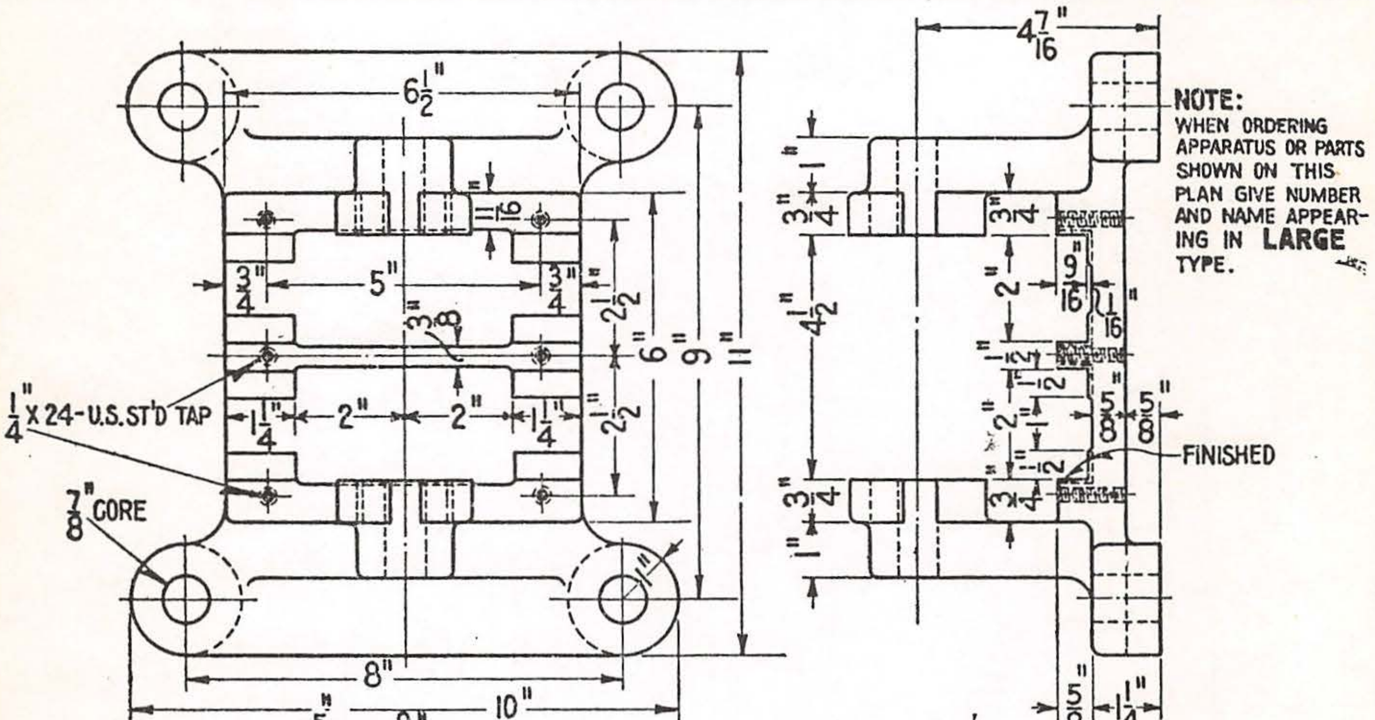
(DETAILS AND ASSEMBLY)

DEC.1915 | SEP.1915 | SEP 1914 | OCT. 1912

RSA 1197

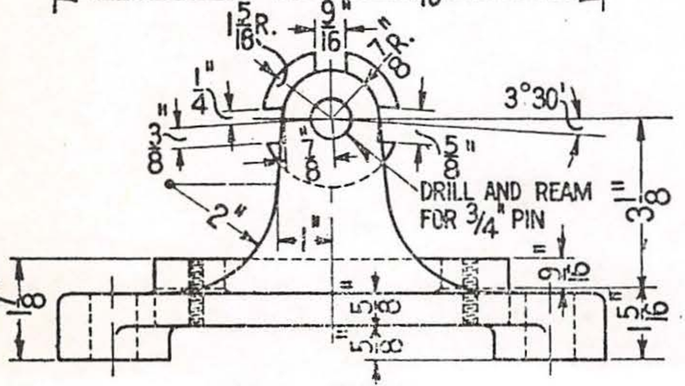
Sheet 1 of 2

S-359-A



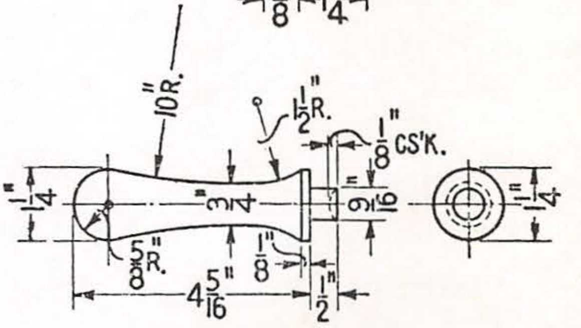
6½"
5"
¾"
⅜"
2½"
6"
9"
11"
¼" X 24-U.S. ST'D TAP
1¼"
2"
⅞" CORE
1"
8"
10"
4 7/16"
1"
4½"
9/16"
1/16"
⅝"
FINISHED
1¼"

NOTE:
WHEN ORDERING APPARATUS OR PARTS SHOWN ON THIS PLAN GIVE NUMBER AND NAME APPEARING IN **LARGE** TYPE.



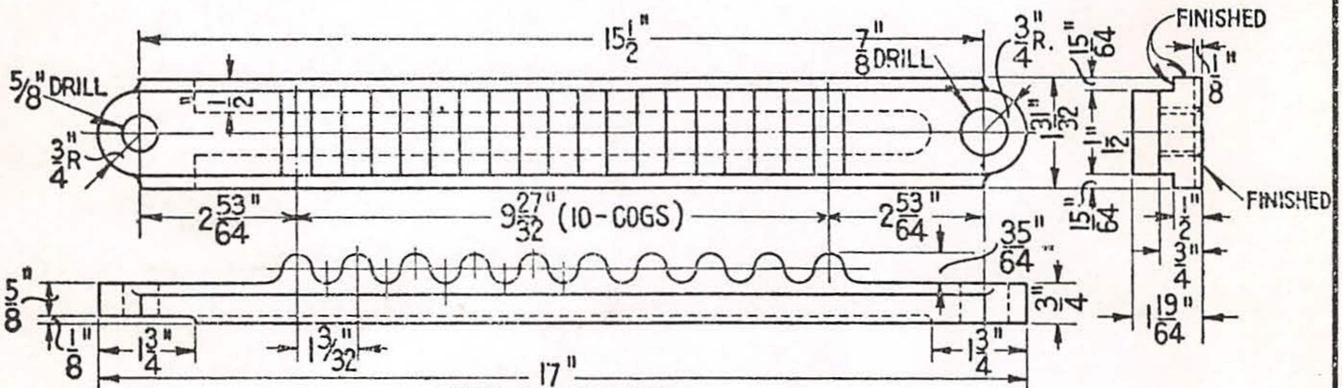
1 5/16" R.
9/16"
⅞" R.
¼"
3°30'
⅜"
⅞"
⅝"
2"
DRILL AND REAM FOR ¾" PIN
3⅛"
⅞"
9/16"
1 5/16"

13971 BASE
(CAST IRON)



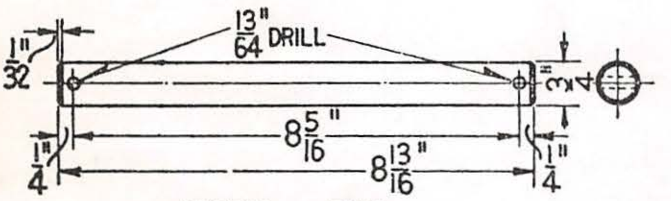
10" R.
1½" R.
⅛" CS'K.
1¼"
¾"
9/16"
⅝" R.
⅛"
4 5/16"
½"

13975 LEVER HANDLE
(MALLEABLE IRON)



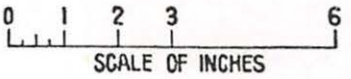
15½"
⅞" DRILL
¾" R.
15/64
FINISHED
5/8" DRILL
¾" R
½"
1 31/32"
1½
2 53/64"
9 27/32" (10-COGS)
35/64"
⅝"
⅛"
1¾"
1 3/32"
17"
1 19/64"
¾"

13974 RACK
(CAST IRON)

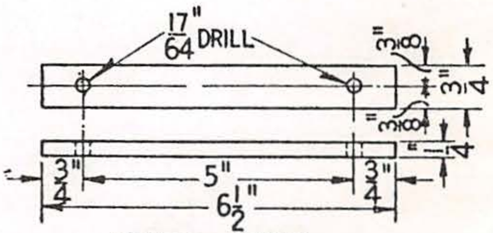


13/64" DRILL
1/32"
¾"
8 5/16"
8 13/16"
¼"

13973 PIN
(C. R. STEEL)



0 1 2 3 6
SCALE OF INCHES



17/64" DRILL
⅜"
¾"
¼"
5"
6½"

13972 STOP
(O. H. STEEL)

Sheet 2 of 2

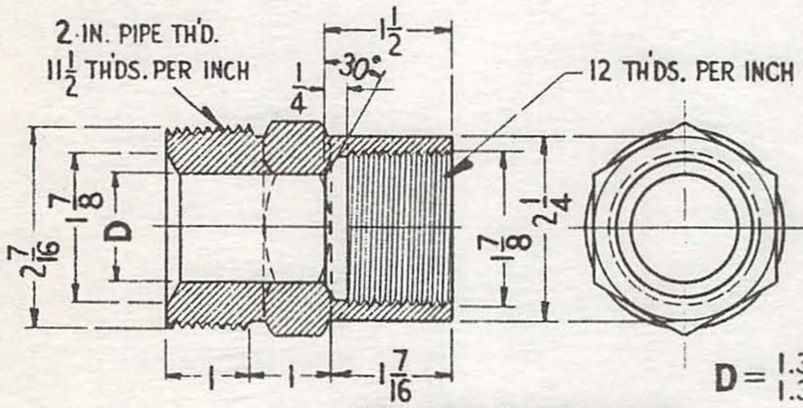
TWO-LEVER WALL MACHINE
(DETAILS)

RSA
1397

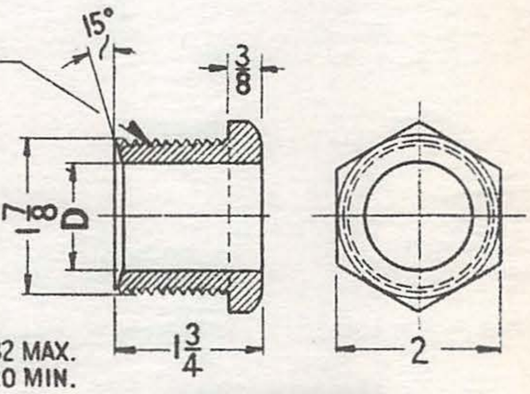
DEC.1915 SEP.1915

See 1197.
Cast iron shall be in accordance with Specification for Gray Iron Castings.
Malleable iron shall be in accordance with Specification for Malleable Iron Castings.

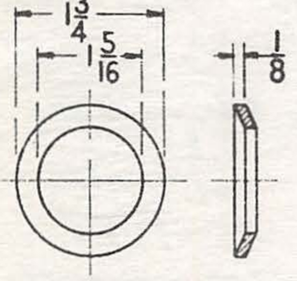
S-359-A


2 IN. PIPE TH'D.
11½ TH'DS. PER INCH
1½
¼
30°
12 TH'DS. PER INCH
2 7/16
1 7/8
D
1 7/8
2¼
1
1
1 7/16
D = 1.382 MAX. 1.320 MIN.

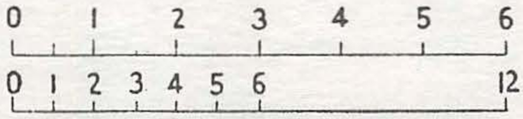
12251 EXTENSION GLAND
MALLEABLE IRON


15°
⅜
1 7/8
D
1¾
2

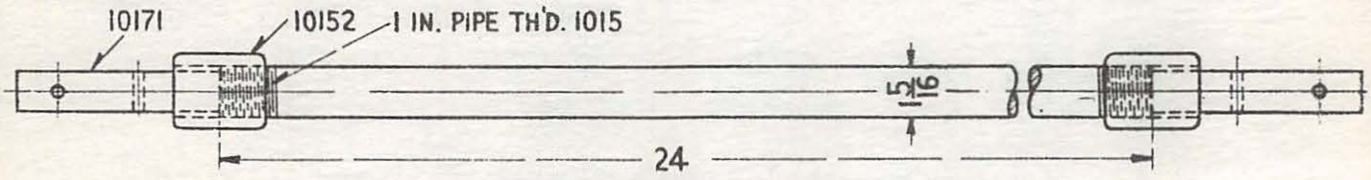
12252 BUSHING
CAST BRASS



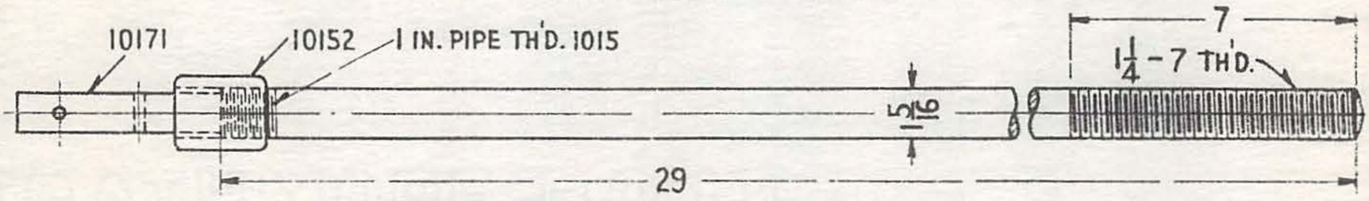
12253 GASKET, LEATHER


0
1
2
3
4
5
6
0
1
2
3
4
5
6
12

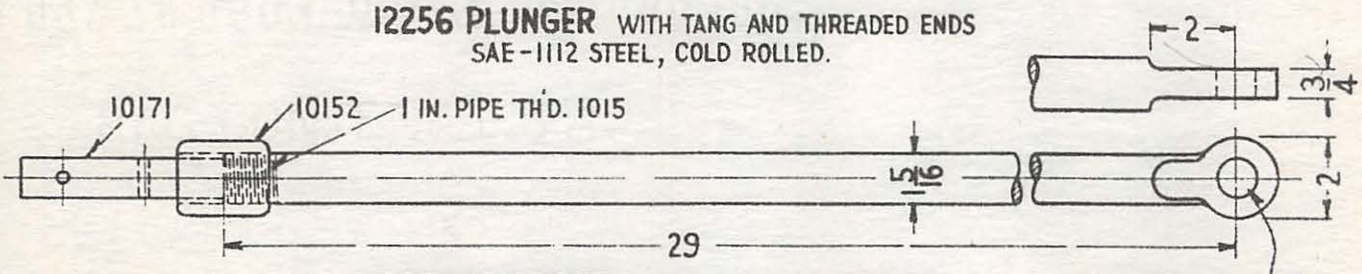
SCALES AND ALL DIMENSIONS GIVEN IN INCHES


10171
10152
1 IN. PIPE TH'D. 1015
1 5/16
24

12255 PLUNGER WITH TANG ENDS
SAE-1112 STEEL, COLD ROLLED.

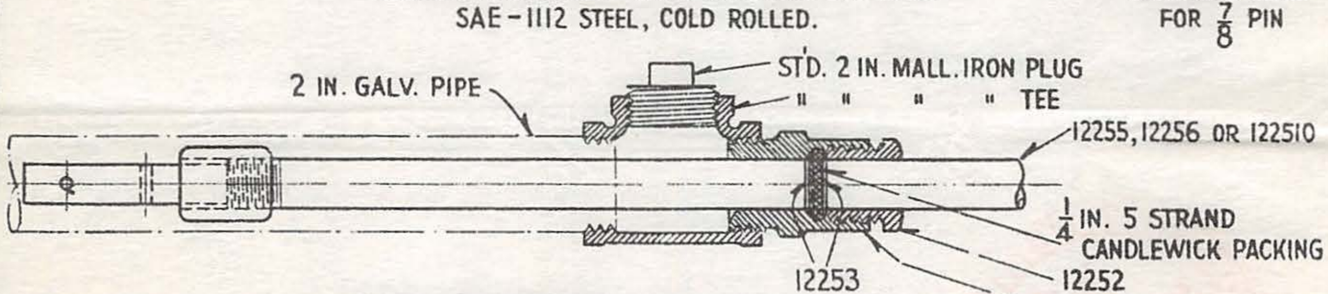

10171
10152
1 IN. PIPE TH'D. 1015
7
1¼-7 TH'D.
1 5/16
29

12256 PLUNGER WITH TANG AND THREADED ENDS
SAE-1112 STEEL, COLD ROLLED.


2
¾
10171
10152
1 IN. PIPE TH'D. 1015
1 5/16
2
29

122510 PLUNGER WITH TANG AND EYE ENDS
SAE-1112 STEEL, COLD ROLLED.

DRILL AND REAM
FOR ⅞ PIN


ST'D. 2 IN. MALL. IRON PLUG
" " " " TEE
2 IN. GALV. PIPE
12255, 12256 OR 122510
¼ IN. 5 STRAND CANDLEWICK PACKING
12253
12252
12251

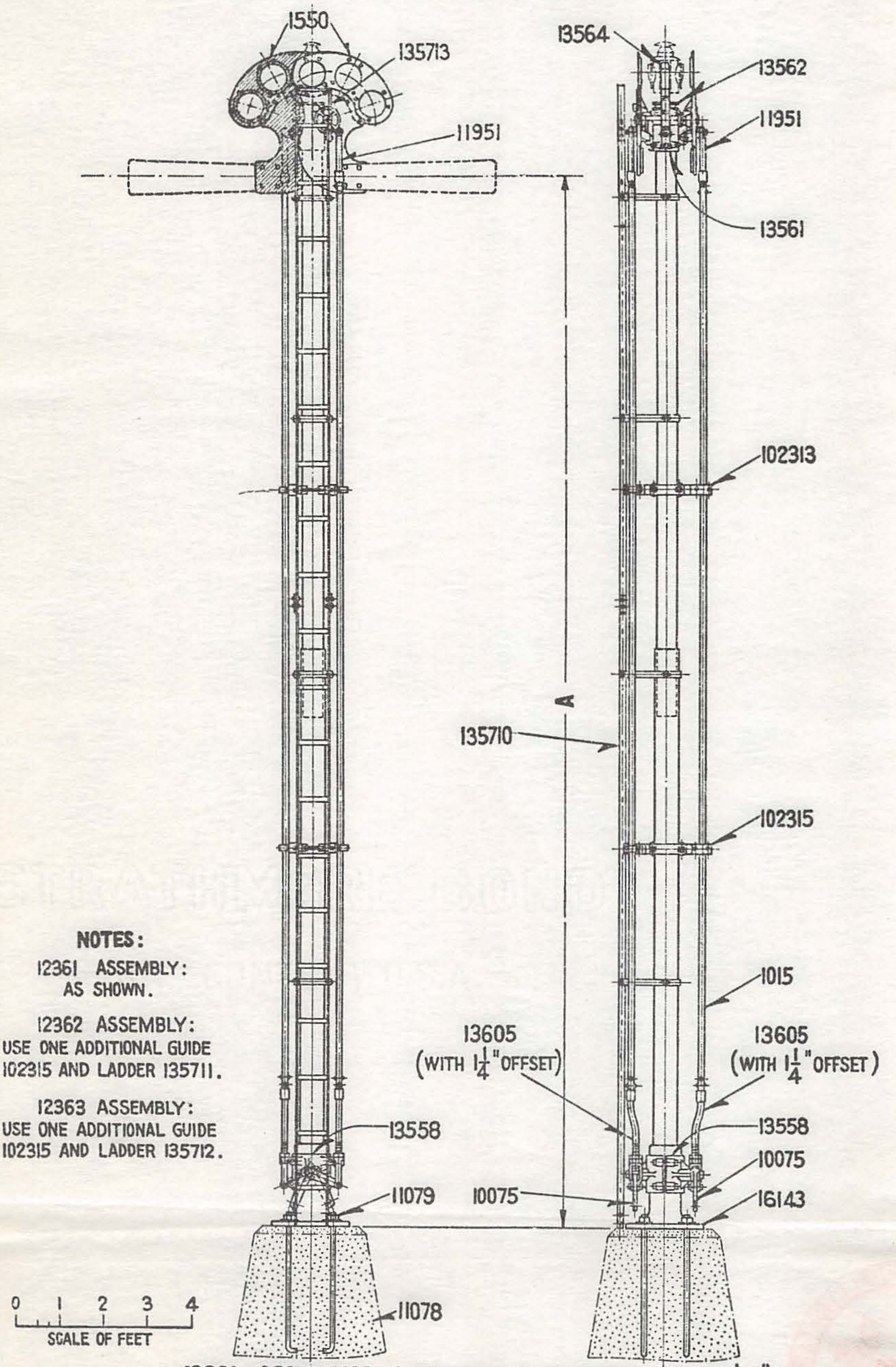
12257 ASSEMBLY WITH 12255
12258 " WITH 12256
12259 " WITH 122510

STUFFING BOX
FOR ONE INCH PIPE

AAR
SIG. SEC.
1225C

M-1944 | OCT. 1944 | MAN. 1926 | SEP. 1924 | MAR. 1913 | OCT. 1912

S-360


1550
135713
11951
13564
13562
11951
13561
102313
A
135710
102315
1015
13605
(WITH 1¼" OFFSET)
13605
(WITH 1¼" OFFSET)
13558
13558
10075
11079
10075
16143
11078
0 1 2 3 4
SCALE OF FEET

NOTES:

12361 ASSEMBLY:
AS SHOWN.

12362 ASSEMBLY:
USE ONE ADDITIONAL GUIDE 102315 AND LADDER 135711.

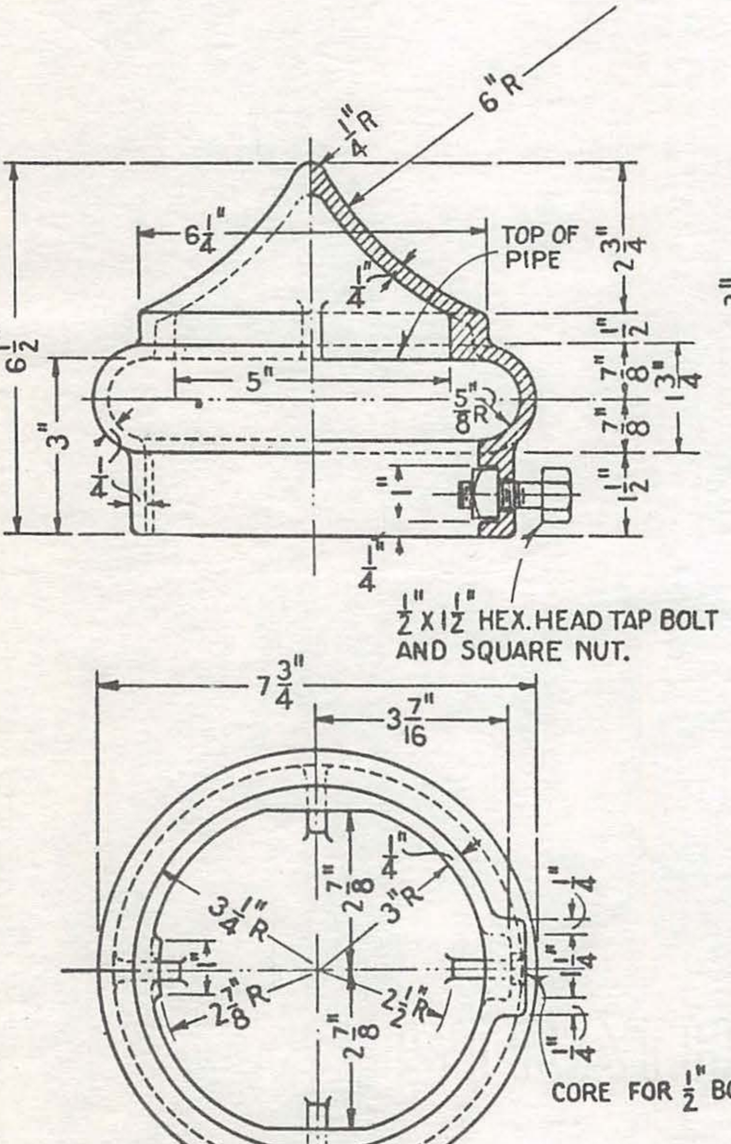
12363 ASSEMBLY:
USE ONE ADDITIONAL GUIDE 102315 AND LADDER 135712.

12361 ASSEMBLY (WITH ONE-ARM MAST 103514 – A = 23'-7")
12362 ASSEMBLY (WITH TWO-ARM MAST 103515 – A = 30'-7")
12363 ASSEMBLY (WITH THREE-ARM MAST 103516 – A = 36'-7")

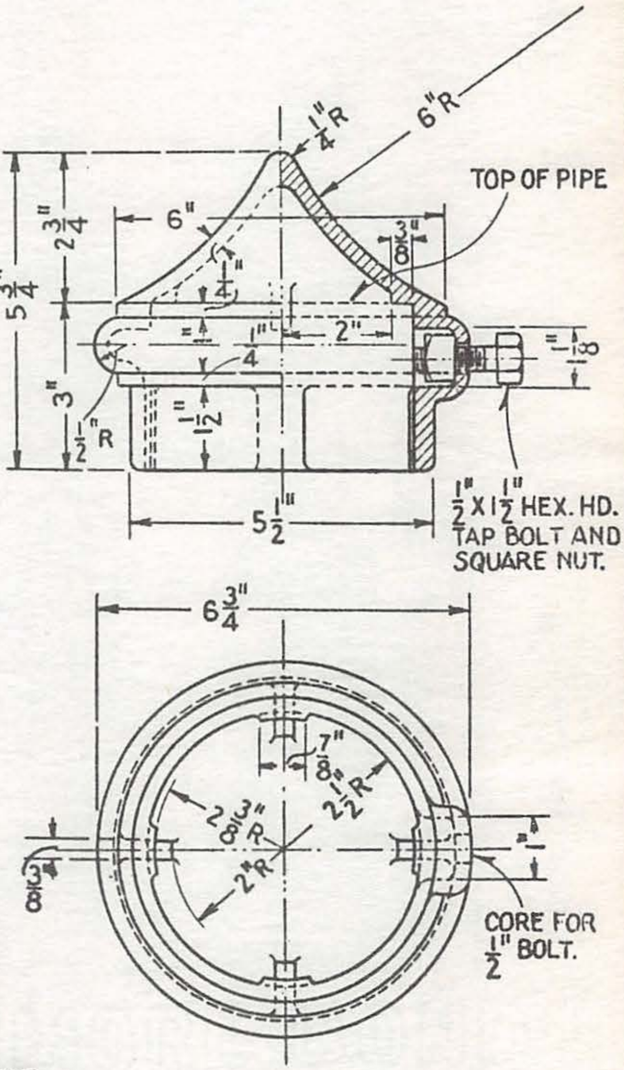
TWO-WAY SINGLE-LAMP SIGNAL

			M-1943	OCT.1943	M-1936	MAR.1936	MAN.1926	SEP.1924	NOV.1923	MAR.1916	MAR.1914	AAR SIG. SEC. 1236D

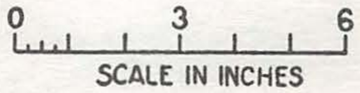
S-361


1/4"R
6"R
6 1/4"
TOP OF PIPE
2 3/4"
1/4"
6 1/2"
1/2"
5"
5/8"R
7/8"
7/8"
1 3/4"
3"
3"
1/4"
1"
1 1/2"
1/4"
1/2" X 1 1/2" HEX. HEAD TAP BOLT AND SQUARE NUT.
7 3/4
3 7/16"
1/4"
2 7/8"
3 1/4"R
3"R
1/4"
1"
2 7/8"R
2 1/2"R
1 1/4"
2 7/8"
1/4"
CORE FOR 1/2" BOLT
3/8"

12451 5 INCH PINNACLE
CAST IRON


1/4"R
6"R
TOP OF PIPE
6"
2 3/4"
5 3/4"
3/8"
1/4"
1"
1/4"
2"
1 1/8"
3"
2 1/2"R
1 1/2"
5 1/2"
1/2" X 1 1/2" HEX. HD. TAP BOLT AND SQUARE NUT.
6 3/4"
7/8"
2 3/8"R
2 1/2"R
2"R
3/8"
1"
CORE FOR 1/2" BOLT.

12452 4 INCH PINNACLE
CAST IRON

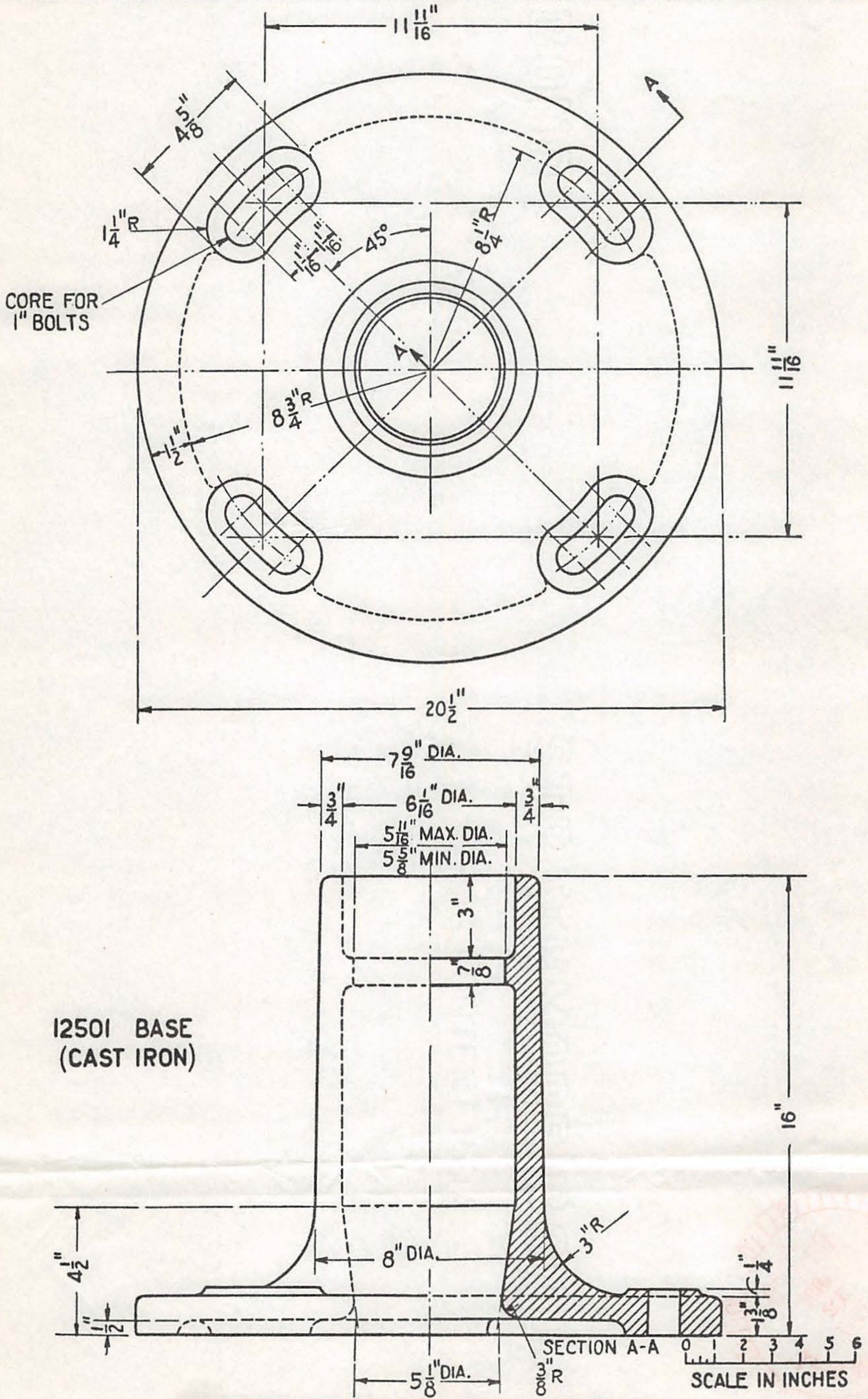

0
3
6
SCALE IN INCHES

S-362

SHORT PINNACLES

AAR
SIG. SEC.
1245A

M-1935 MAR 1935

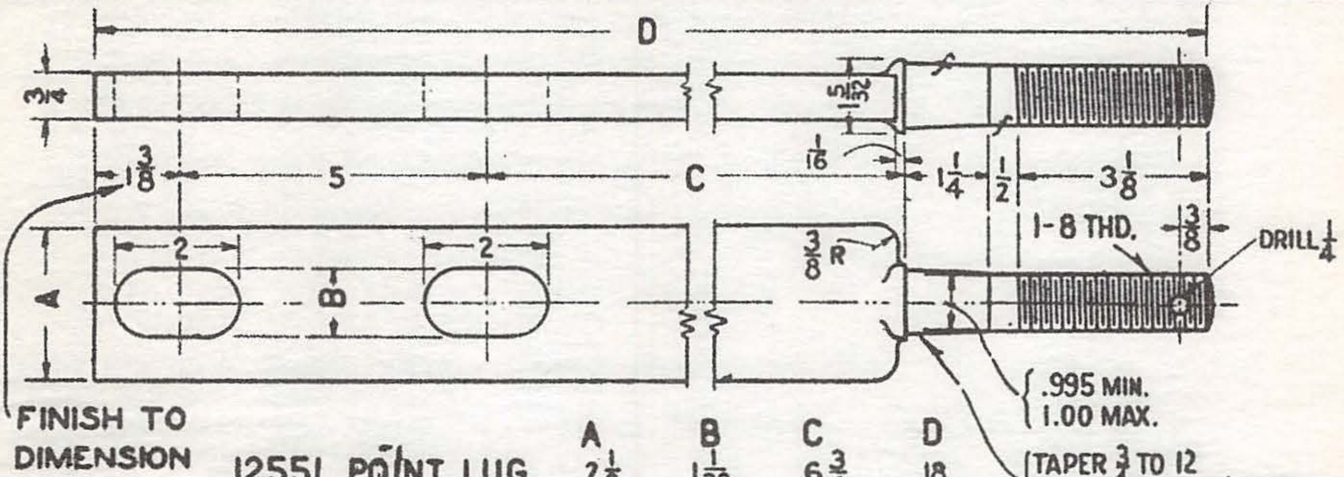

11 11/16"
4 5/8"
A
1 1/4"R
1 1/16"
1 1/16"
45°
8 1/4"R
CORE FOR 1" BOLTS
A
8 3/4"R
1 1/2"
11 11/16"
20 1/2"
7 9/16" DIA.
3/4"
6 1/16" DIA.
3/4"
5 11/16" MAX. DIA.
5 5/8" MIN. DIA.
3"
7/8"
12501 BASE
(CAST IRON)
16"
4 1/2"
8" DIA.
3"R
1/4"
3/8"
1 1/2"
SECTION A-A
3/8"R
5 1/8" DIA.
0 1 2 3 4 5 6
SCALE IN INCHES

SOCKET BASE FOR 5 INCH MAST

M-1935 MAR1935

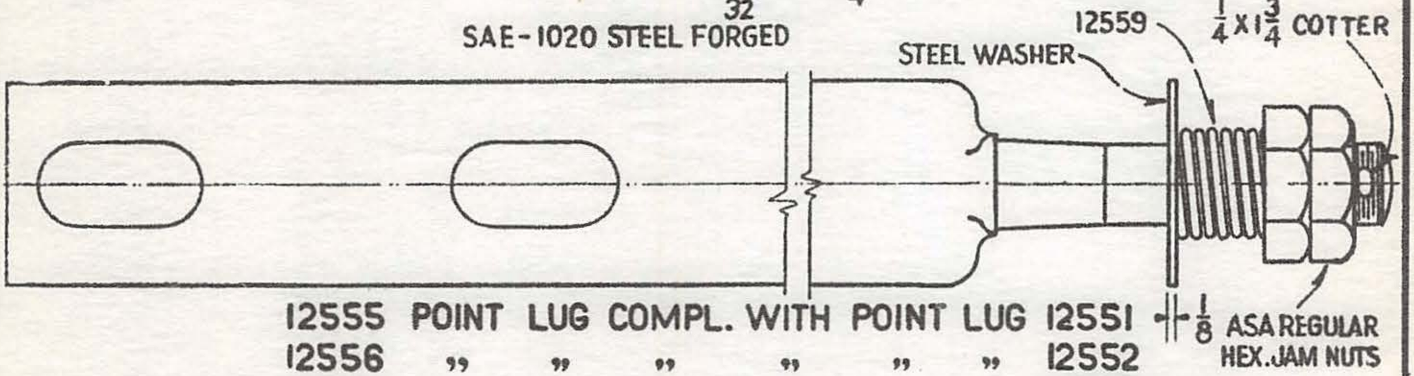
AAR
SIG.SEC.
1250A

S-363

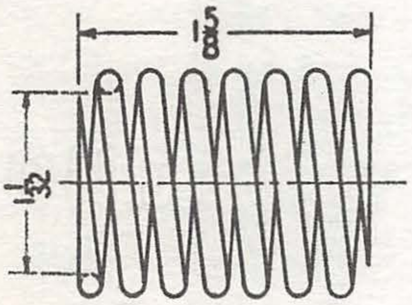

D
$\frac{3}{4}$
$1\frac{5}{32}$
$\frac{1}{16}$
$1\frac{3}{8}$
5
C
$1\frac{1}{4}$
$\frac{1}{2}$
$3\frac{1}{8}$
2
2
A
B
$\frac{3}{8}$ R
1-8 THD.
$\frac{3}{8}$
DRILL $\frac{1}{4}$
.995 MIN.
1.00 MAX.
TAPER $\frac{3}{4}$ TO 12
TOTAL TAPER = $1\frac{1}{2}$ TO 12
FINISH TO DIMENSION

	A	B	C	D
12551 POINT LUG	$2\frac{1}{2}$	$1\frac{1}{32}$	$6\frac{3}{4}$	18
12552 " "	2	$\frac{25}{32}$	4	$15\frac{1}{4}$
12553 " "	$2\frac{1}{2}$	$1\frac{1}{32}$	4	$15\frac{1}{4}$
12554 " "	2	$\frac{25}{32}$	$6\frac{3}{4}$	18

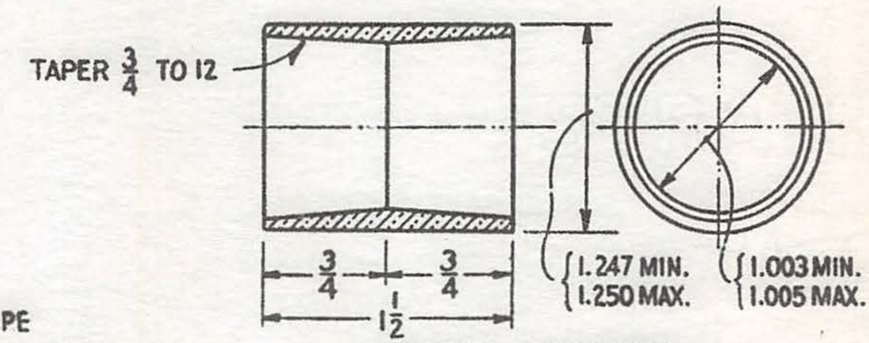
SAE-1020 STEEL FORGED


STEEL WASHER
12559
$\frac{1}{4}$ X $1\frac{3}{4}$ COTTER
$\frac{1}{8}$
ASA REGULAR HEX. JAM NUTS

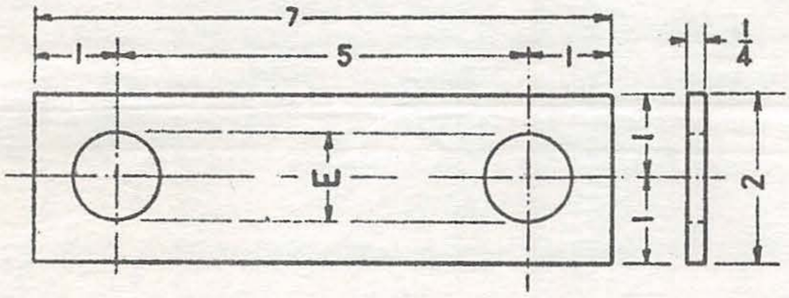
12555 POINT LUG COMPL. WITH POINT LUG 12551
12556 " " " " " " 12552
12557 " " " " " " 12553
12558 " " " " " " 12554

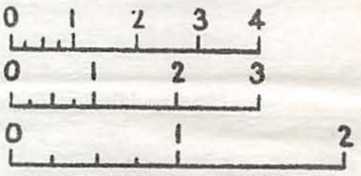

$1\frac{5}{8}$
$1\frac{1}{32}$

12559 SPRING
.125 DIA. 18-8 STAINLESS STEEL SPRING WIPE
MATERIAL: 18 % CHROME, 8 % NICKEL
7 TURNS, 5 ACTIVE
SOLID COMPRESSION WITHOUT SET.


TAPER $\frac{3}{4}$ TO 12
$\frac{3}{4}$
$\frac{3}{4}$
$1\frac{1}{2}$
1.247 MIN.
1.250 MAX.
1.003 MIN.
1.005 MAX.

125510 BUSHING
SAE-64 BRONZE


7
1
5
1
$\frac{1}{4}$
E
1
1
2


0 1 2 3 4
0 1 2 3
0 1 2

SCALES AND ALL DIMENSIONS GIVEN IN INCHES

125511 PLATE E = $1\frac{1}{32}$
125512 " E = $\frac{25}{32}$
SAE-1020 STEEL

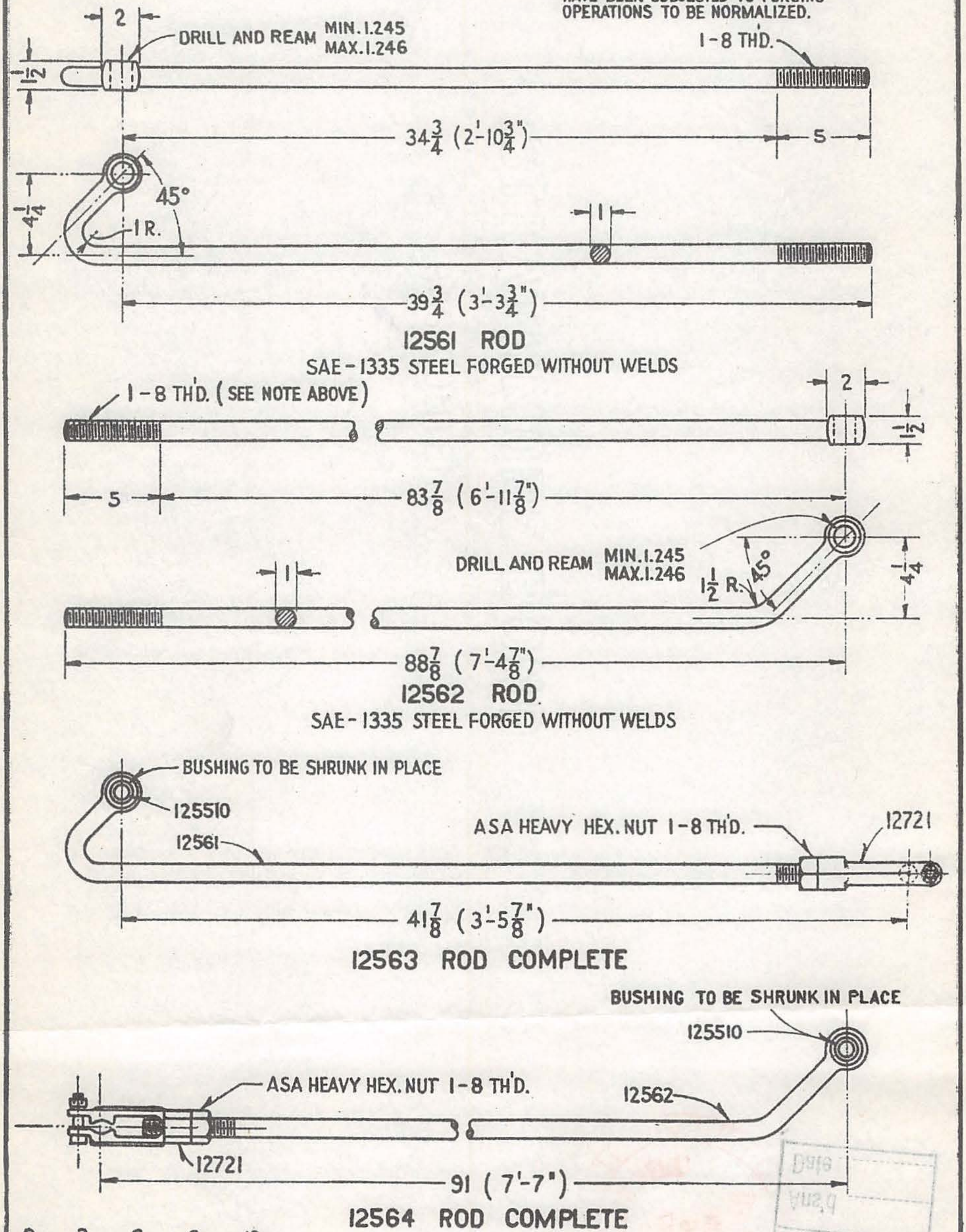
SWITCH CIRCUIT CONTROLLER LUG

AAR
SIG. SEC.
1255D

				M-1940	OCT. 1940	M-1938	APR. 1938	M-1937	MAR 1937	M-1935	MAR1935

S-364

NOTE:
THREADED ENDS AND PORTIONS WHICH HAVE BEEN SUBJECTED TO FORGING OPERATIONS TO BE NORMALIZED.


2
DRILL AND REAM MIN. 1.245 MAX. 1.246
1-8 THD.
1½
34¾ (2'-10¾")
5
45°
4¼
1 R.
1
39¾ (3'-3¾")
1-8 TH'D. (SEE NOTE ABOVE)
2
1½
5
83⅞ (6'-11⅞")
DRILL AND REAM MIN. 1.245 MAX. 1.246
1
1½ R.
45°
4¼
88⅞ (7'-4⅞")
BUSHING TO BE SHRUNK IN PLACE
125510
12561
ASA HEAVY HEX. NUT 1-8 TH'D.
12721
41⅞ (3'-5⅞")
BUSHING TO BE SHRUNK IN PLACE
125510
ASA HEAVY HEX. NUT 1-8 TH'D.
12562
12721
91 (7'-7")

12561 ROD
SAE-1335 STEEL FORGED WITHOUT WELDS

12562 ROD.
SAE-1335 STEEL FORGED WITHOUT WELDS

12563 ROD COMPLETE

12564 ROD COMPLETE

0 3 6 9 12
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

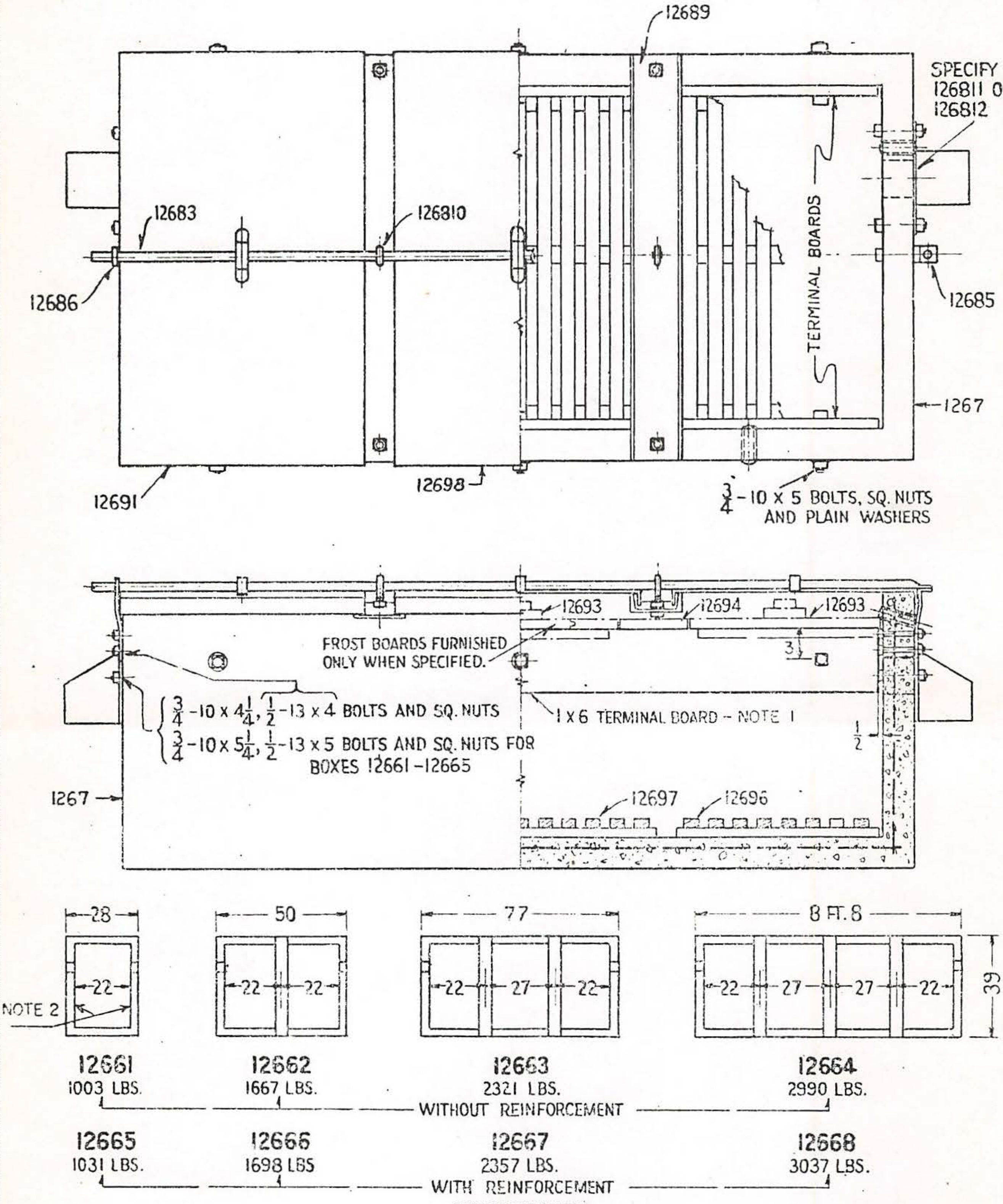
S-365

SWITCH CIRCUIT CONTROLLER RODS

RECEIVED
MAILING DEPT.
JUN 13 1947
A.M.
Ans'd
Date

M-1944	OCT. 1944	M-1940	OCT. 1940	M-1935	MAR. 1935	AAR SIG. SEC. 1256 C

RECEIVED
MAILING DEPT.
JUN 13 1947
A.M.
Ans'd
Date

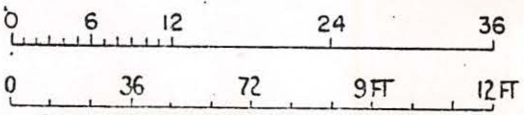

12689
SPECIFY 126811 OR 126812
12683
126810
12686
TERMINAL BOARDS
12685
1267
12691
12698
3/4-10 x 5 BOLTS, SQ. NUTS AND PLAIN WASHERS
12693
12694
12693
FROST BOARDS FURNISHED ONLY WHEN SPECIFIED.
3
3/4-10 x 4 1/4, 1/2-13 x 4 BOLTS AND SQ. NUTS
3/4-10 x 5 1/4, 1/2-13 x 5 BOLTS AND SQ. NUTS FOR BOXES 12661-12665
1 x 6 TERMINAL BOARD - NOTE 1
1/2
1267
12697
12696
28
22
NOTE 2
50
22
22
77
22
27
22
8 FT. 8
22
27
27
22
39
12661
1003 LBS.
12662
1667 LBS.
12663
2321 LBS.
12664
2990 LBS.
WITHOUT REINFORCEMENT
12665
1031 LBS.
12666
1698 LBS
12667
2357 LBS.
12668
3037 LBS.
WITH REINFORCEMENT

ASSEMBLIES

COMPLETE WITH ACCESSORIES AS REQUIRED

NOTES:

1- TERMINAL BOARDS TO BE GOOD QUALITY WELL SEASONED CYPRESS, FIR OR WHITE PINE
2- BOXES 12661 AND 12665 SHALL HAVE TERMINAL BOARDS LOCATED ON 39 INCH SIDE
3- BOLTS AND NUTS SHALL BE GALVANIZED OR CADMIUM PLATED


0
6
12
24
36
0
36
72
9 FT
12 FT

SCALES AND ALL DIMENSIONS GIVEN IN INCHES
UNLESS OTHERWISE INDICATED.

CONCRETE BATTERY BOX

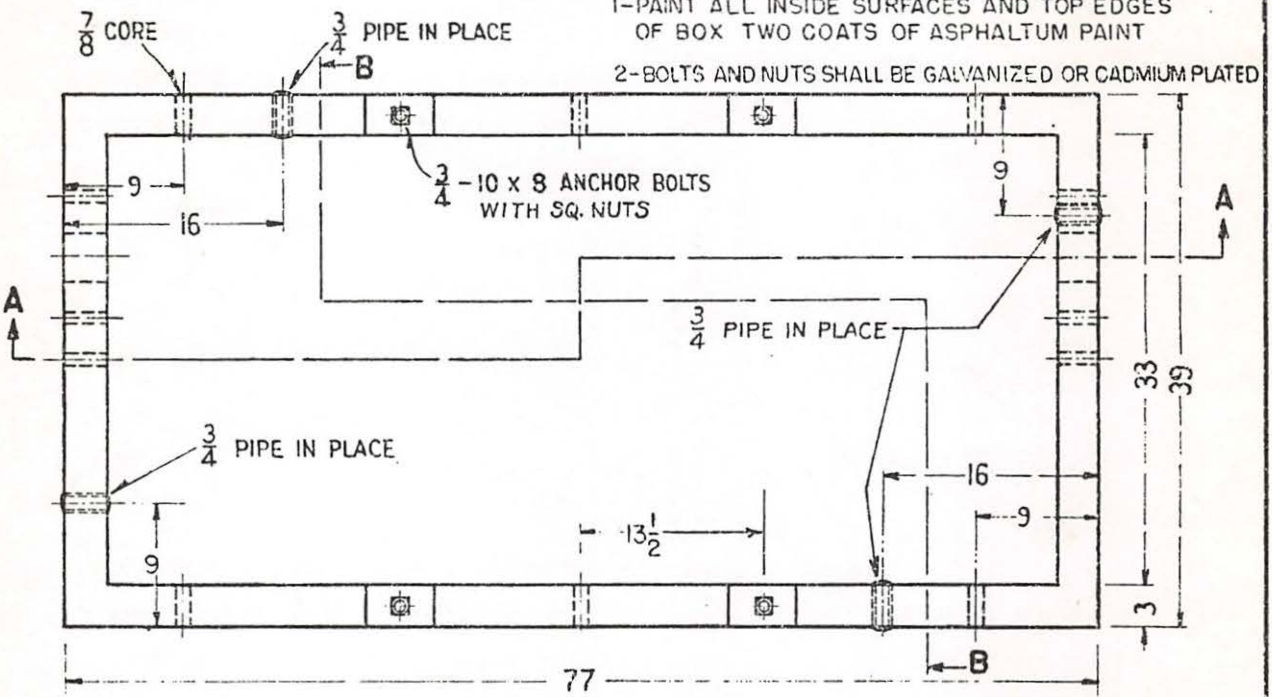
DETAILS AND ASSEMBLIES

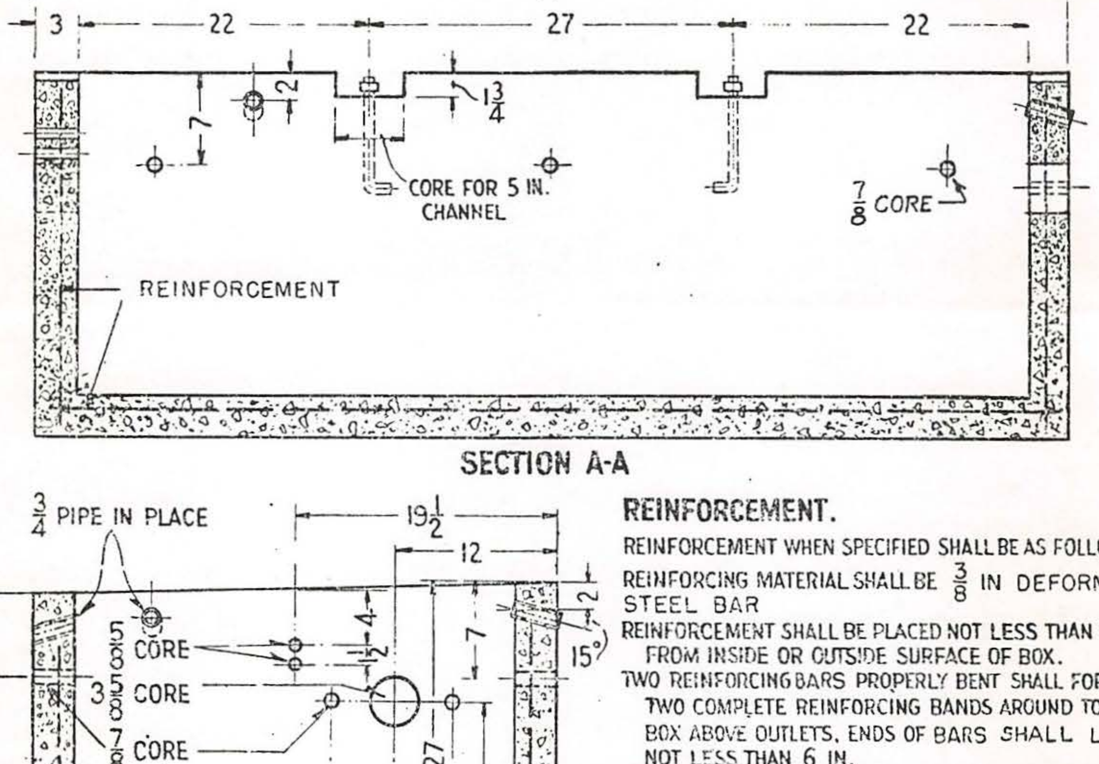
AAR
SIG. SEC.
1266E

		M-1957	SEP.1957	M-1945	OCT. 1945	M-1941	SEP.1941	M-1939	MAR.1939	M-1936	MAR.1936

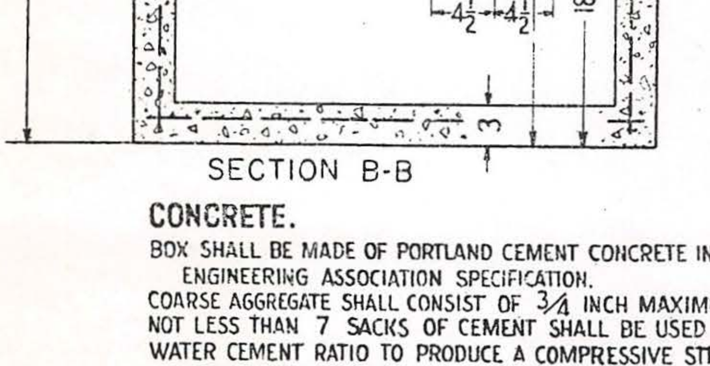
Bolts, nuts and threads shall be in accordance with Specifications for Bolts, Nuts and Threads, Manual Part 17.

NOTES:
1-PAINT ALL INSIDE SURFACES AND TOP EDGES OF BOX TWO COATS OF ASPHALTUM PAINT
2-BOLTS AND NUTS SHALL BE GALVANIZED OR CADMIUM PLATED


$\frac{7}{8}$ CORE
$\frac{3}{4}$ PIPE IN PLACE
B
$\frac{3}{4}$-10 x 8 ANCHOR BOLTS WITH SQ. NUTS
9
16
9
A
A
$\frac{3}{4}$ PIPE IN PLACE
$\frac{3}{4}$ PIPE IN PLACE
33
39
16
9
$13\frac{1}{2}$
9
3
B
77


3
22
27
22
7
2
$1\frac{3}{4}$
CORE FOR 5 IN. CHANNEL
$\frac{7}{8}$ CORE
REINFORCEMENT

SECTION A-A


$\frac{3}{4}$ PIPE IN PLACE
$19\frac{1}{2}$
12
2
15°
6
4
$1\frac{1}{2}$
7
$\frac{5}{8}$ CORE
$3\frac{5}{8}$ CORE
$\frac{7}{8}$ CORE
26
27
$18\frac{1}{2}$
$4\frac{1}{2}$
$4\frac{1}{2}$
3

SECTION B-B

REINFORCEMENT.

REINFORCEMENT WHEN SPECIFIED SHALL BE AS FOLLOWS:

REINFORCING MATERIAL SHALL BE $\frac{3}{8}$ IN DEFORMED STEEL BAR

REINFORCEMENT SHALL BE PLACED NOT LESS THAN 1 IN. FROM INSIDE OR OUTSIDE SURFACE OF BOX.

TWO REINFORCING BARS PROPERLY BENT SHALL FORM TWO COMPLETE REINFORCING BANDS AROUND TOP OF BOX ABOVE OUTLETS. ENDS OF BARS SHALL LAP NOT LESS THAN 6 IN.

ONE REINFORCING BAR OF LENGTH 2 IN. LESS THAN THE HEIGHT OF WALL, SHALL BE PLACED VERTICALLY 2 IN. FROM INSIDE CORNER IN EACH WALL.

BOTTOM OF BOX SHALL BE REINFORCED LENGTHWISE AND CROSSWISE WITH REINFORCING BARS OF LENGTH 2 IN. LESS THAN OUTSIDE DIMENSION OF THE BOX AND SPACED NOT MORE THAN 12 IN. APART.

CONCRETE.

BOX SHALL BE MADE OF PORTLAND CEMENT CONCRETE IN ACCORDANCE WITH AMERICAN RAILWAY ENGINEERING ASSOCIATION SPECIFICATION.

COARSE AGGREGATE SHALL CONSIST OF $\frac{3}{4}$ INCH MAXIMUM SIZE STONE OR GRAVEL.

NOT LESS THAN 7 SACKS OF CEMENT SHALL BE USED PER CUBIC YARD OF CONCRETE.

WATER CEMENT RATIO TO PRODUCE A COMPRESSIVE STRENGTH OF NOT LESS THAN 3000 POUNDS PER SQUARE INCH AFTER 28 DAYS SHALL BE USED.

0 3 6 9 12 24 36

SCALE AND ALL DIMENSIONS GIVEN IN INCHES

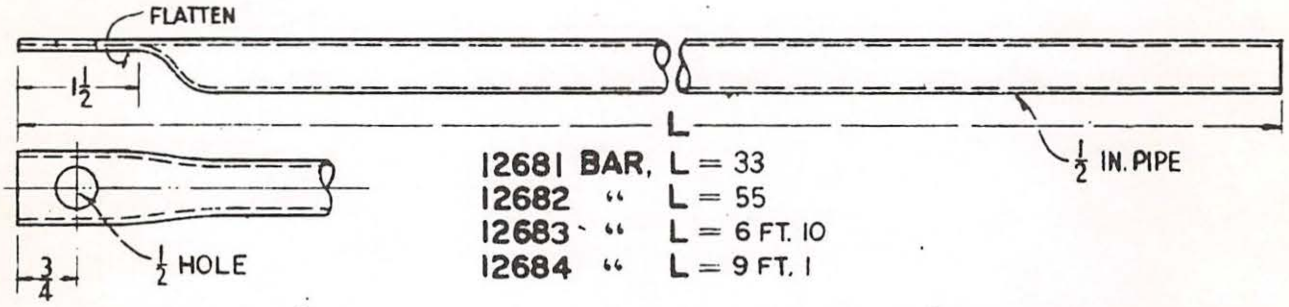
CONCRETE BATTERY BOX

DETAILS

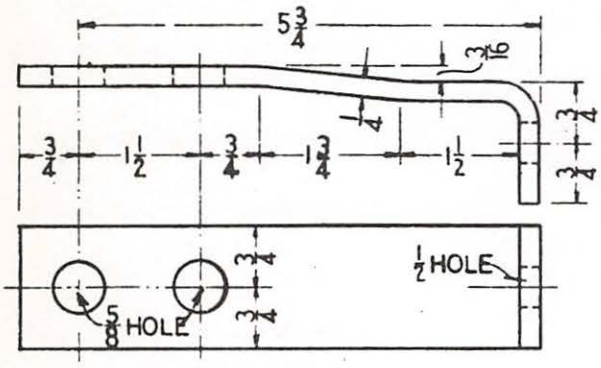
		M-1957	SEP. 1957	M-1945	OCT. 1945	M-1941	SEP. 1941	M-1939	MAR. 1939	M-1936	MAR. 1936	AAR SIG. SEC. 1267E

Bolts, nuts and threads shall be in accordance with Specifications for Bolts, Nuts and Threads, Manual Part 17.

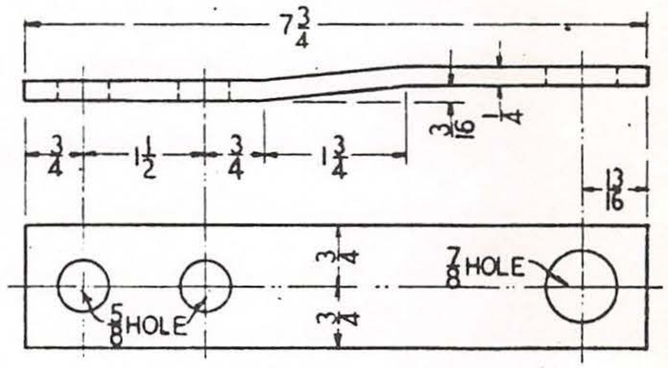
Steel shall be in accordance with Specifications for Various Types of Steel, Manual Part 154. Section 1. Cast iron shall be Class 20 in accordance with Specification for Gray Iron Castings, Manual Part 88. Bolts, nuts and threads shall be in accordance with Specifications for Bolts, Nuts and Threads, Manual Part 17. Painting shall be in accordance with Instructions for Painting, Manual Part 110, using two coats of gray finishing paint except underside of channel, as indicated, be given two coats of asphaltum paint.


FLATTEN
$1\frac{1}{2}$
L
$\frac{1}{2}$ IN. PIPE
$\frac{1}{2}$ HOLE
$\frac{3}{4}$

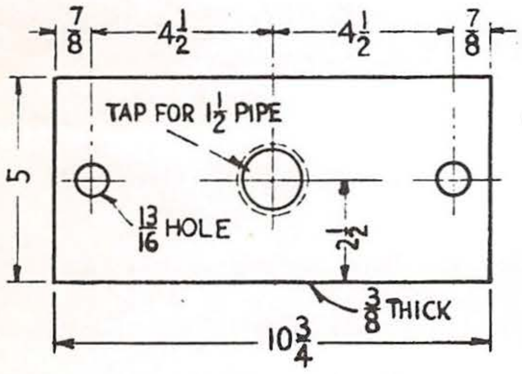
12681 BAR, L = 33
12682 " L = 55
12683 " L = 6 FT. 10
12684 " L = 9 FT. 1


$5\frac{3}{4}$
$\frac{3}{16}$
$\frac{1}{4}$
$\frac{3}{4}$
$1\frac{1}{2}$
$\frac{3}{4}$
$1\frac{3}{4}$
$1\frac{1}{2}$
$\frac{3}{4}$
$\frac{3}{4}$
$\frac{3}{4}$
$\frac{3}{4}$
$\frac{1}{2}$ HOLE
$\frac{5}{8}$ HOLE

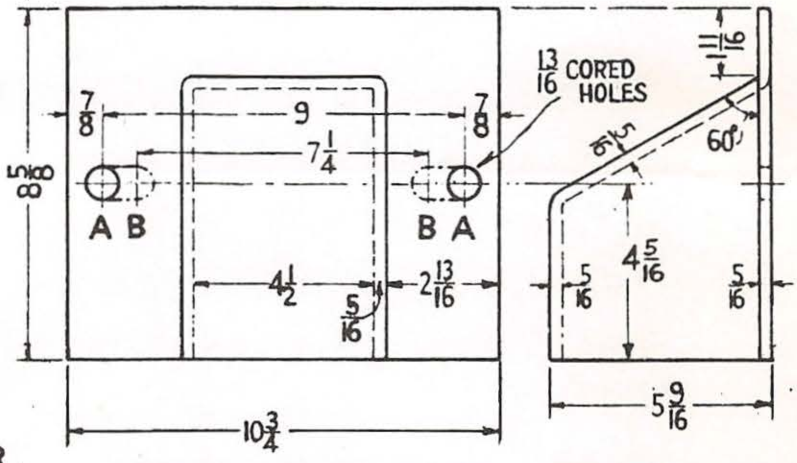
12685 HASP
STEEL


$7\frac{3}{4}$
$\frac{3}{16}$
$\frac{1}{4}$
$\frac{3}{4}$
$1\frac{1}{2}$
$\frac{3}{4}$
$1\frac{3}{4}$
$\frac{13}{16}$
$\frac{3}{4}$
$\frac{3}{4}$
$\frac{7}{8}$ HOLE
$\frac{5}{8}$ HOLE

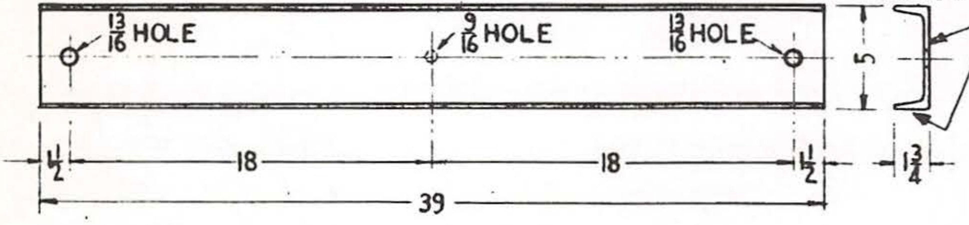
12686 BRACKET
STEEL


$\frac{7}{8}$
$4\frac{1}{2}$
$4\frac{1}{2}$
$\frac{7}{8}$
TAP FOR $1\frac{1}{2}$ PIPE
5
$\frac{13}{16}$ HOLE
$2\frac{1}{2}$
$\frac{3}{8}$ THICK
$10\frac{3}{4}$

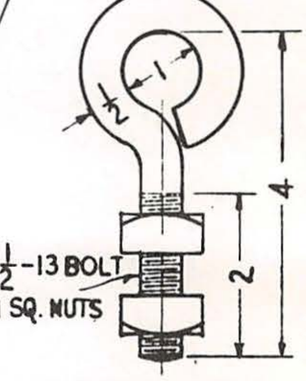
126811 OUTLET COVER
STEEL


$\frac{7}{8}$
9
$\frac{7}{8}$
$7\frac{1}{4}$
$8\frac{5}{8}$
A B
B A
$4\frac{1}{2}$
$\frac{5}{16}$
$2\frac{13}{16}$
$10\frac{3}{4}$
$\frac{13}{16}$ CORED HOLES
$\frac{11}{16}$
$\frac{5}{8}$
60°
$4\frac{5}{16}$
$\frac{5}{16}$
$\frac{5}{16}$
$5\frac{9}{16}$

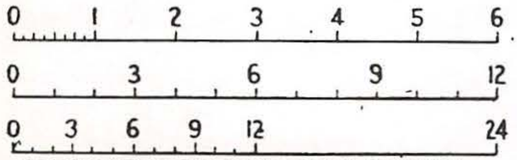
126812 OUTLET CAP WITH HOLES 'A'
126813 " " " SLOTS 'A B'
126813 FOR REPLACEMENT ONLY, ORDER AS REQ'D.
CAST IRON


$\frac{13}{16}$ HOLE
$\frac{9}{16}$ HOLE
$\frac{13}{16}$ HOLE
5
$1\frac{3}{4}$
$1\frac{1}{2}$
18
18
$1\frac{1}{2}$
39
PAINT ASPHALTUM

12689 CHANNEL
CARNEGIE SEC. NO. C-8, 6.7 LBS. PER FT.


1
$\frac{1}{2}$
4
2
$\frac{1}{2}$-13 BOLT
WITH SQ. NUTS

126810 EYE BOLT
STEEL


0 1 2 3 4 5 6
0 3 6 9 12
0 3 6 9 12 24

SCALES AND ALL DIMENSIONS GIVEN IN INCHES

NOTE:
BOLT AND NUTS SHALL BE GALVANIZED OR CADMIUM PLATED

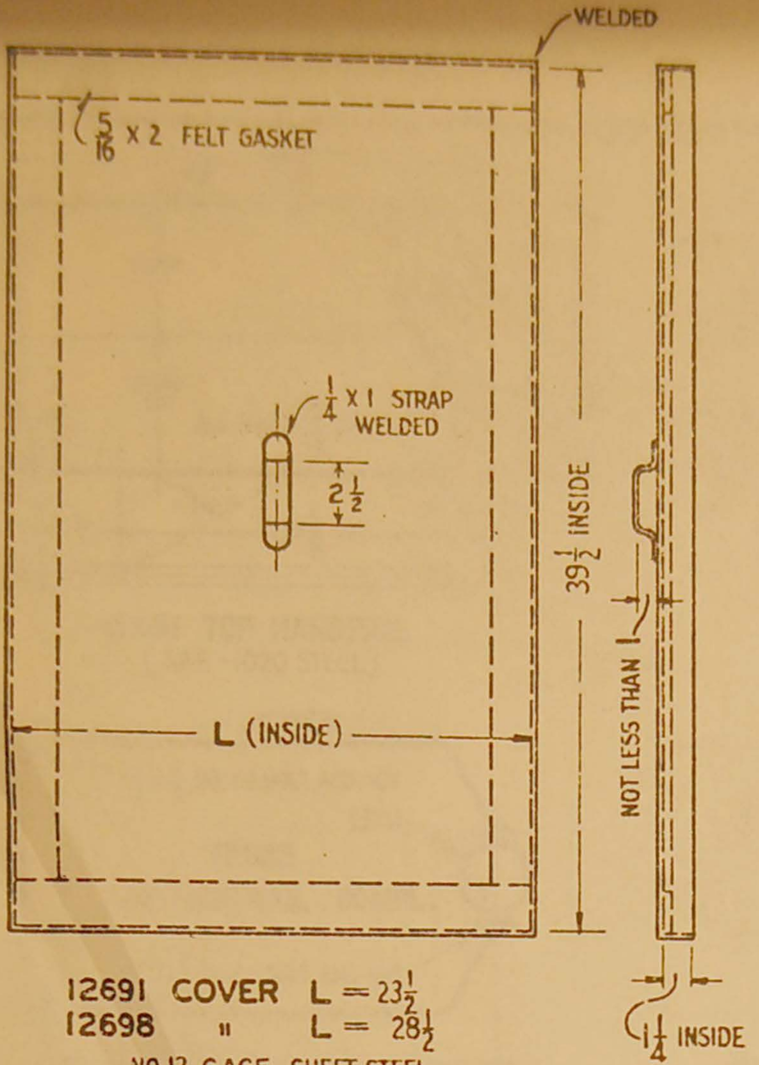
CONCRETE BATTERY BOX

DETAILS

AAR
SIG. SEC.
1268E

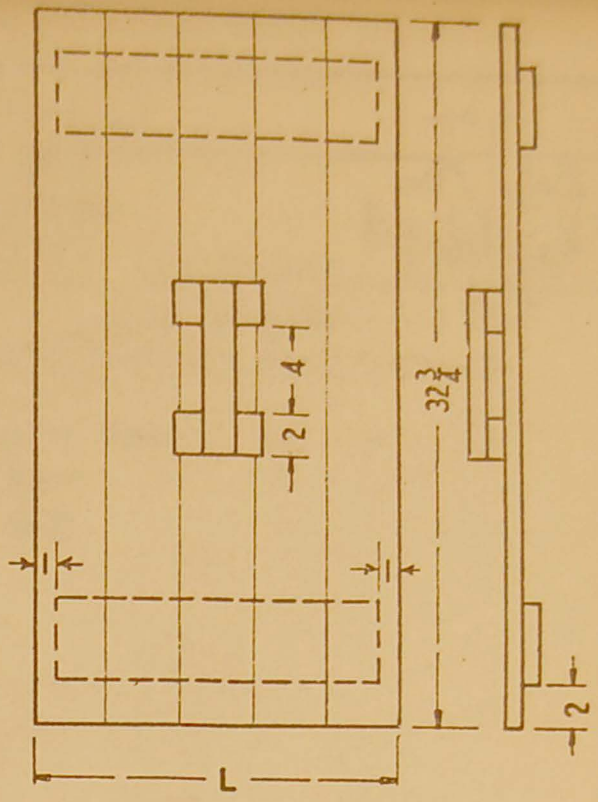
M-1957	SEP. 1957	M-1945	OCT. 1945	M-1941	SEP. 1941	M-1939	MAR. 1939	M-1936	MAR. 1936

S-368-E


WELDED
$\frac{5}{16}$ X 2 FELT GASKET
$\frac{1}{4}$ X 1 STRAP WELDED
$2\frac{1}{2}$
L (INSIDE)
$39\frac{1}{2}$ INSIDE
NOT LESS THAN 1
$1\frac{1}{4}$ INSIDE

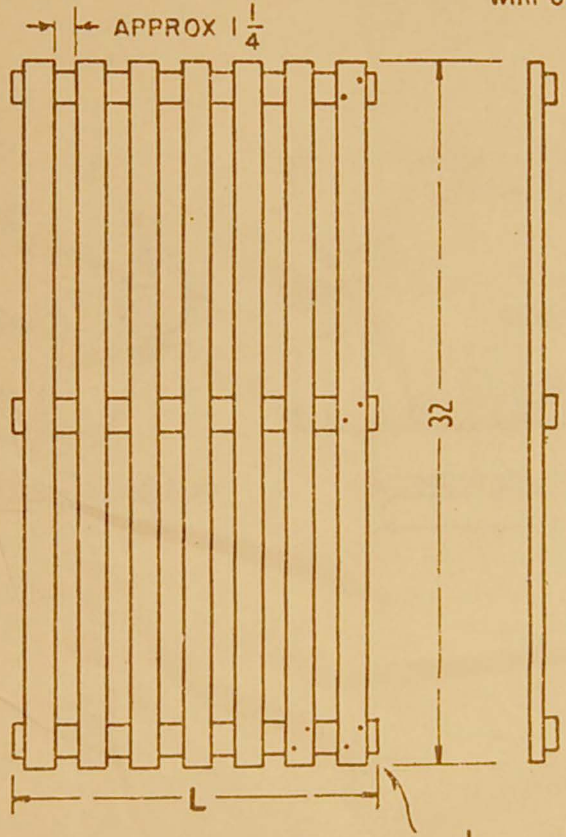
12691 COVER L = $23\frac{1}{2}$
12698 " L = $28\frac{1}{2}$

NO.12 GAGE SHEET STEEL.
(0.1046)


1
1
4
2
$32\frac{3}{4}$
2
L

12692 FROST BOARD L = $21\frac{3}{4}$
12693 " " L = 19
12694 " " L = AS REQ'D AND WITHOUT HANDLE.

$\frac{7}{8}$ T.& G. GOOD QUALITY WELL SEASONED CYPRESS, FIR OR WHITE PINE FASTENED WITH 6 d NAILS CLINCHED ON BOTTOM.


APPROX $1\frac{1}{4}$
32
L

NOTE:
NAILS SHALL BE GALVANIZED OR CADMIUM PLATED

0 3 6 9 12 18
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

12695 SLAT FLOOR L = 21
12696 " " L = $19\frac{1}{2}$
12697 " " L = 26

1 X $1\frac{1}{2}$ GOOD QUALITY WELL SEASONED CYPRESS, FIR OR WHITE PINE FASTENED WITH 6 d NAILS CLINCHED ON BOTTOM.

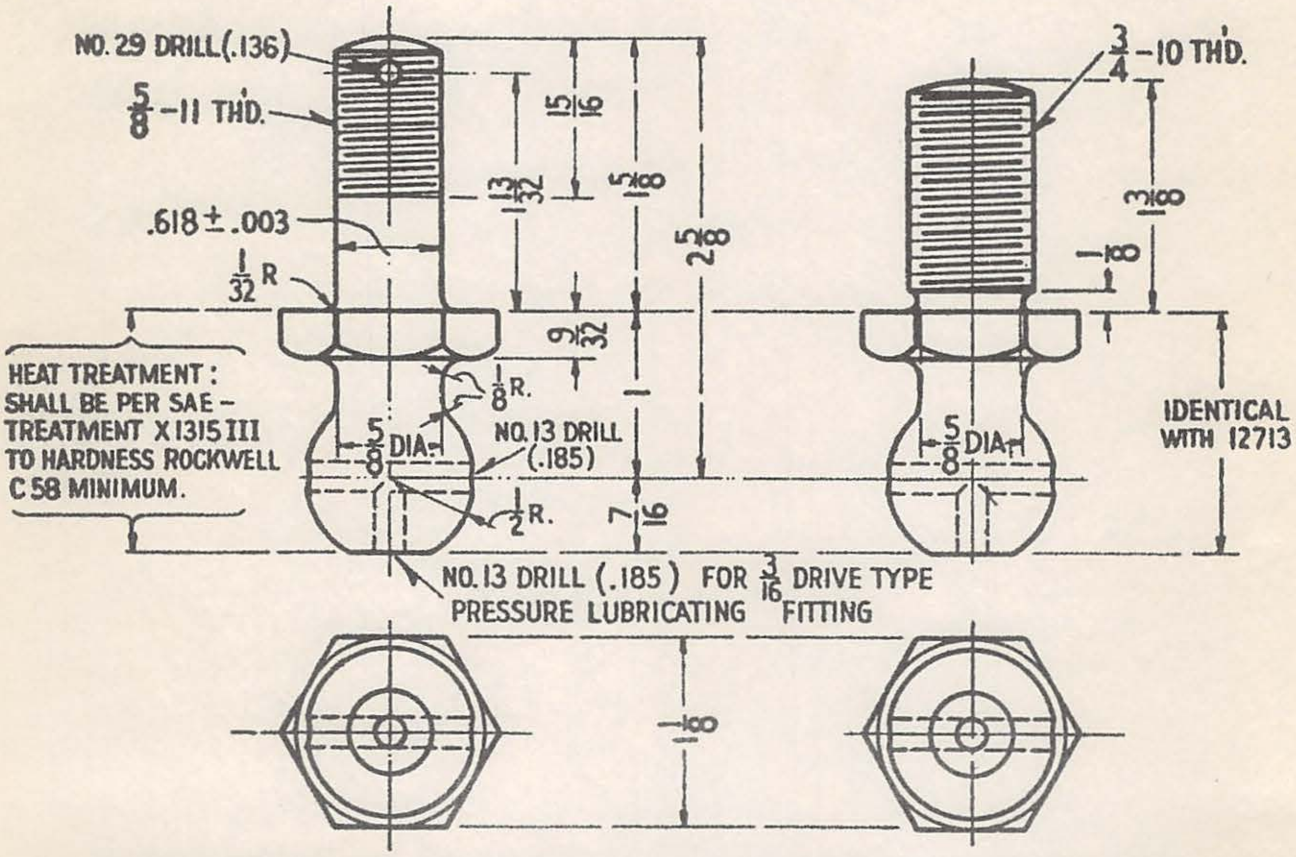
CONCRETE BATTERY BOX
DETAILS

AAR
SIG. SEC.
1269C

					M-1957	SEP-1957	M-1939	MAR.1939	M-1936	MAR.1936

Painting shall be in accordance with Instructions for Painting, Manual Part 110, using two coats of gray finishing paint on top side of cover and two coats of asphaltum paint on under side of cover. All wood parts to have two coats of asphaltum paint.

S-369-C

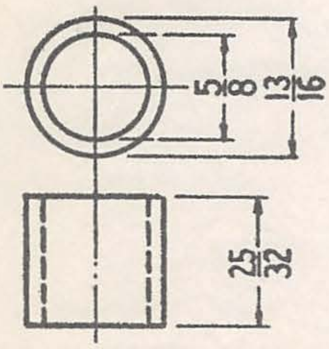

NO. 29 DRILL (.136)
5/8 -11 THD.
.618 ± .003
1/32 R
HEAT TREATMENT: SHALL BE PER SAE - TREATMENT X 1315 III TO HARDNESS ROCKWELL C 58 MINIMUM.
5/8 DIA.
NO. 13 DRILL (.185)
1/8 R.
1/2 R.
15/16
1 13/32
1 5/8
2 5/8
9/32
1
7/16
NO. 13 DRILL (.185) FOR 3/16 DRIVE TYPE PRESSURE LUBRICATING FITTING
1 1/8
3/4 -10 THD.
3 1/8
1/8
5/8 DIA.
IDENTICAL WITH 12713

12713 INSULATING BALL STUD

SAE - X 1315

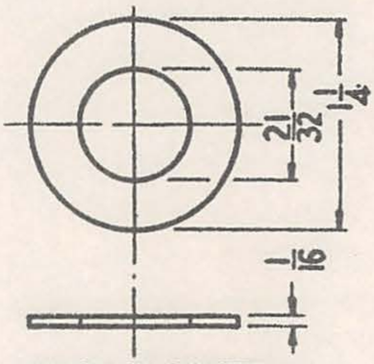
12717 NON-INSULATING BALL STUD

SAE - X 1315


5/8
13/16
25/32

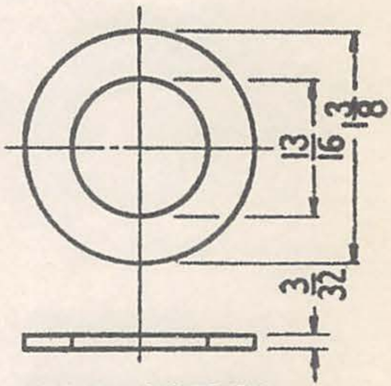
12714 BUSHING

FIBRE


21/32
1 1/4
1/16

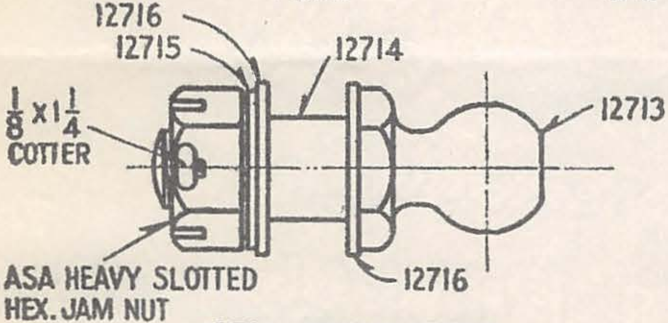
12715 WASHER

SAE - 1020 STEEL

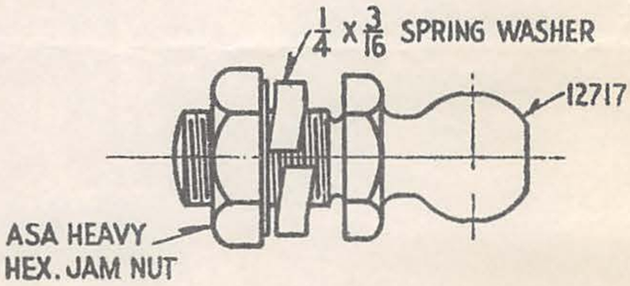

13/16
1 3/8
3/32

12716 WASHER

FIBRE

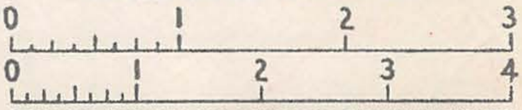

12716
12715
12714
12713
1/8 x 1 1/4 COTTER
ASA HEAVY SLOTTED HEX. JAM NUT
12716

12711 INSULATING BALL STUD COMPL.


1/4 x 3/16 SPRING WASHER
12717
ASA HEAVY HEX. JAM NUT

12712 NON-INSULATING BALL STUD COMPL.

NOTE: CRANK ARM SHALL BE 5/8 IN. THICK PROVIDED WITH 13/16 REAMED HOLE FOR 12711 OR 3/4-10 TH'D FOR 12712.



SCALES AND ALL DIMENSIONS GIVEN IN INCHES

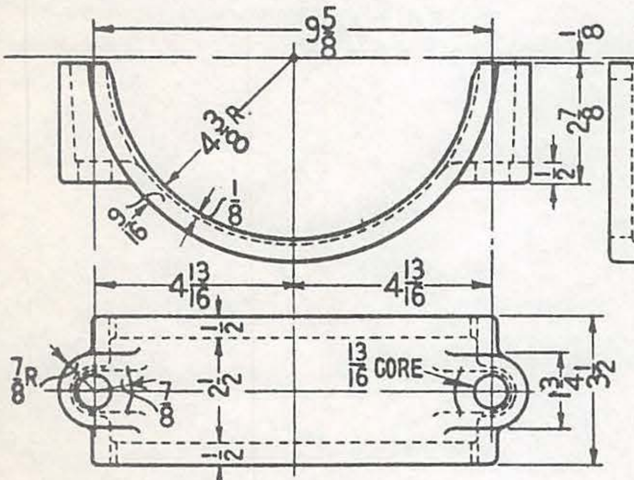
BALL STUDS

(DETAILS AND ASSEMBLIES)

AAR
SIG. SEC.
1271 A

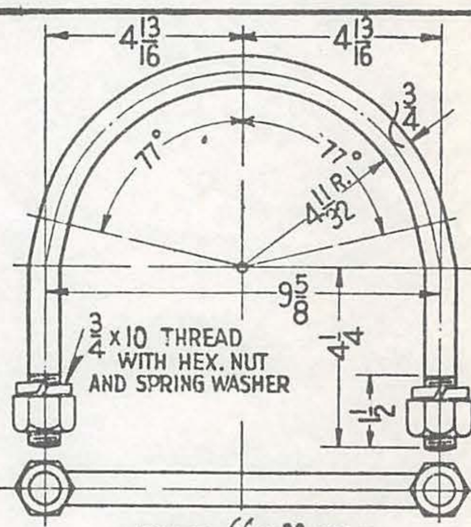
M-1940 OCT. 1940

S-370



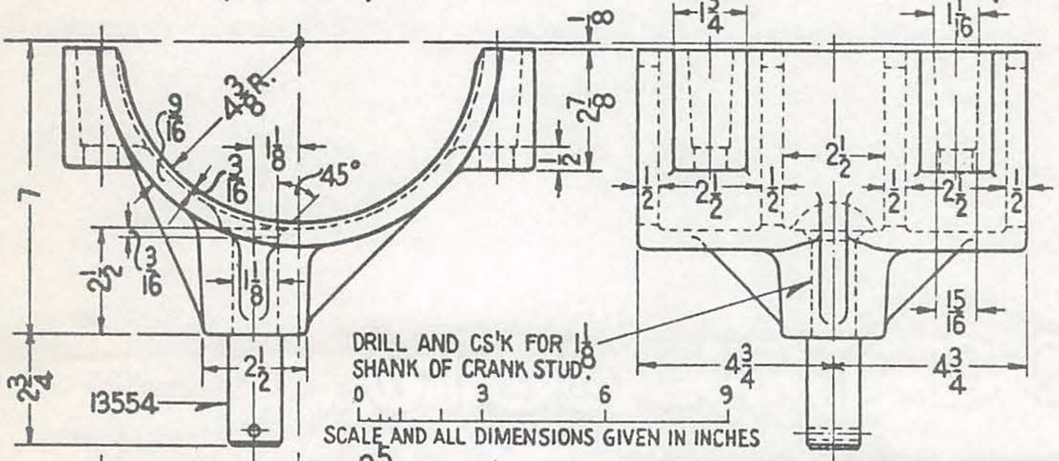
9 5/8
1/8
1 1/16
4 3/8 R.
2 7/8
1/2
9/16
1/8
1 5/16
4 13/16
4 13/16
1/2
7/8 R.
7/8
2 1/2
13/16 CORE
1 3/4
3 1/2
1/2

13551 BACK CLAMP
(CAST IRON)

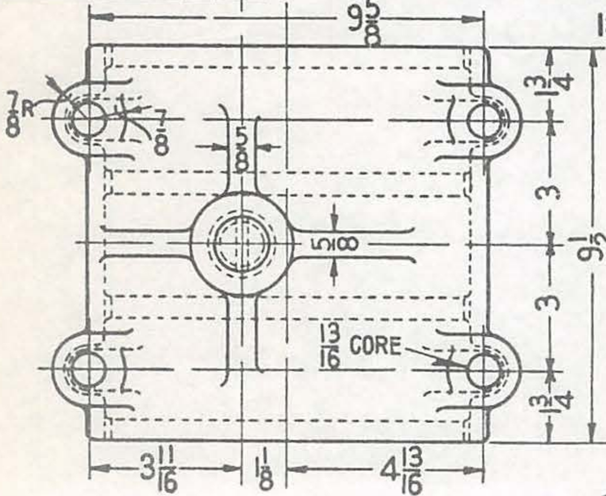


4 13/16
4 13/16
3/4
77°
77°
4 11/32 R.
9 5/8
3/4 X 10 THREAD WITH HEX. NUT AND SPRING WASHER
4 1/4
1 1/2

13552 "U" BOLT
(SAE-1020 STEEL)

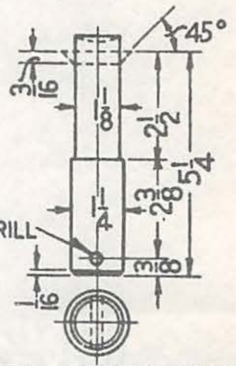


1/8
1 3/4
1 1/16
4 3/8 R.
2 7/8
1/2
7
9/16
1/8
3/16
45°
2 1/2
3/16
1 1/8
2 1/2
2 3/4
13554
2 1/2
1/2
2 1/2
1/2
1/2
2 1/2
1/2
15/16
DRILL AND CS'K FOR 1 1/8 SHANK OF CRANK STUD.
4 3/4
4 3/4
0 3 6 9
SCALE AND ALL DIMENSIONS GIVEN IN INCHES



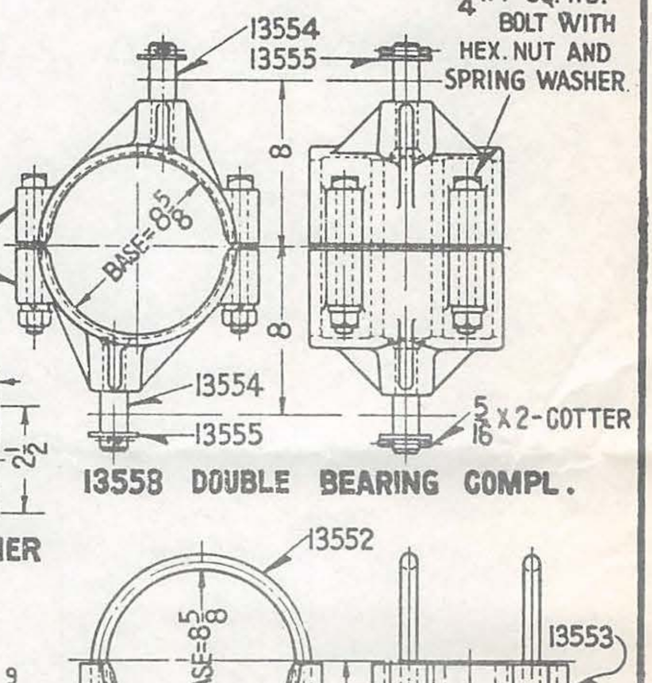
9 5/8
7/8 R.
7/8
1 3/4
5/8
5/8
3
3
9 1/2
13/16 CORE
1 3/4
3 11/16
1 1/8
4 13/16

13553 CRANK BEARING CLAMP
(CAST IRON)



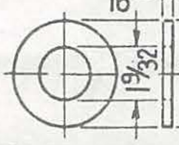
45°
3/16
1 1/8
2 1/2
5 1/4
1 1/4
2 3/8
3/8
5/16 DRILL
1/16

13554 CRANK STUD
(C. R. STEEL)



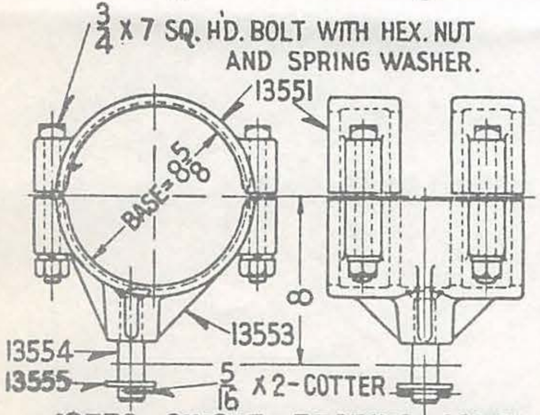
3/4 X 7 SQ. H'D. BOLT WITH HEX. NUT AND SPRING WASHER
13554
13555
13553
BASE=8 5/8
8
8
13554
13555
5/16 X 2-COTTER

13558 DOUBLE BEARING COMPL.



3/16
19/32
2 1/2

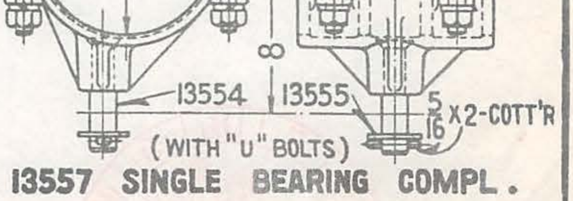
13555 WASHER
(STEEL)



3/4 X 7 SQ. HD. BOLT WITH HEX. NUT AND SPRING WASHER.
13551
BASE=8 5/8
13553
8
13554
13555
5/16 X 2-COTTER

13556 SINGLE BEARING COMPL.
(WITH BACK CLAMPS)

0 3 6 9
SCALE AND ALL DIMENSIONS GIVEN IN INCHES



13552
13553
BASE=8 5/8
8
13554
13555
5/16 X 2-COTT'R
(WITH "U" BOLTS)

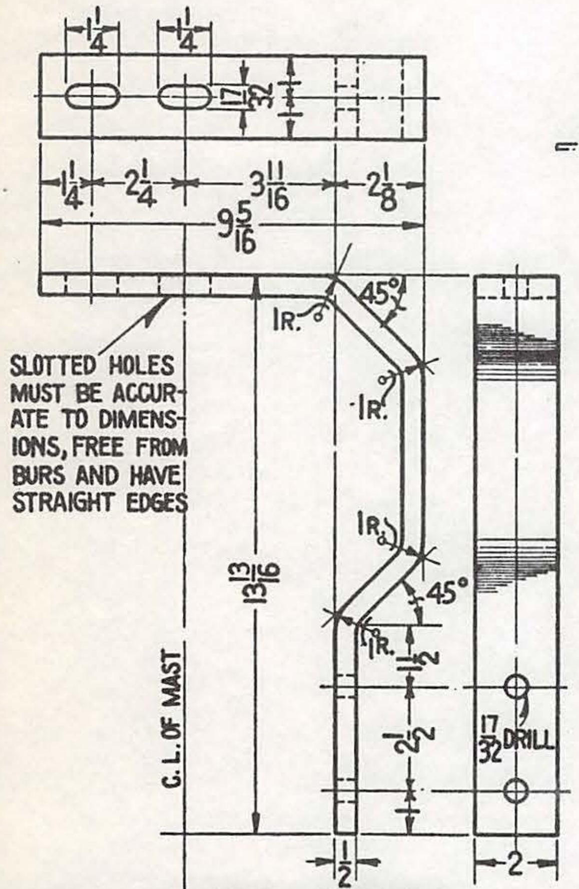
13557 SINGLE BEARING COMPL.

S-372

CRANK BEARINGS AND CLAMPS
(FOR TWO-WAY SINGLE-LAMP SIGNAL)

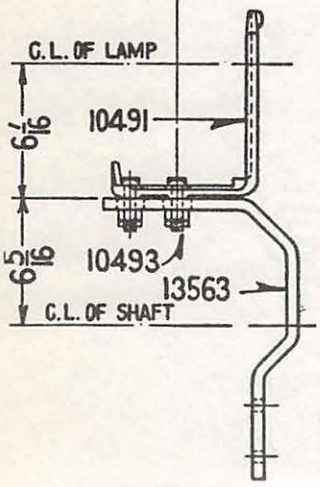
AAR
SIG. SEC.
1355B

M-1941 | SEP. 1941 | MAR. 1916

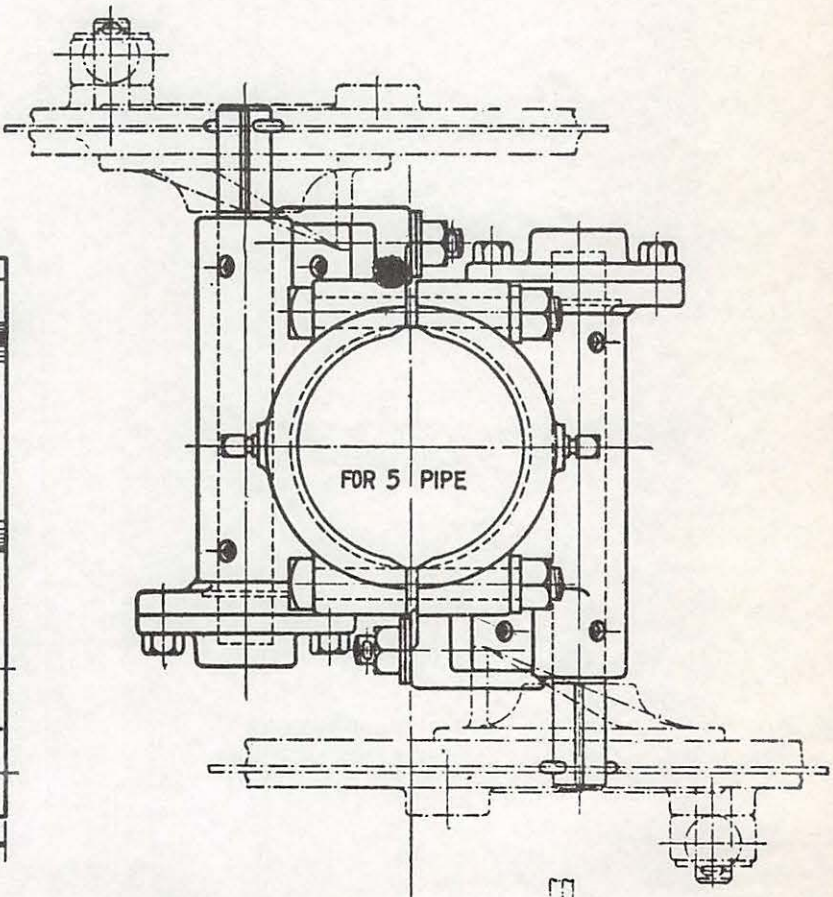

1/4
1/4
17/32
1 1/4
2 1/4
3 11/16
2 1/8
9 5/16
1R.
45°
1R.
1R.
45°
1R.
13 13/16
1 1/2
2 1/2
17/32 DRILL
C. L. OF MAST
1/2
2

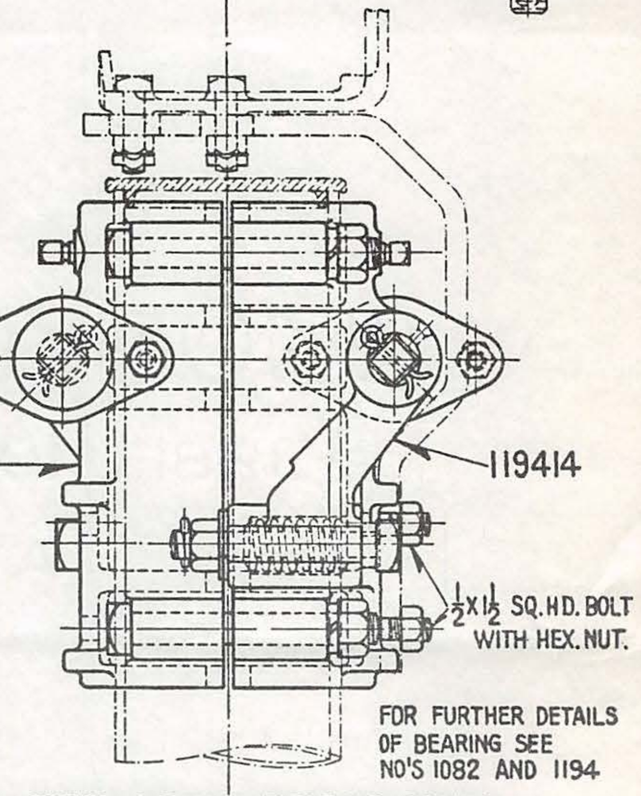
SLOTTED HOLES MUST BE ACCURATE TO DIMENSIONS, FREE FROM BURS AND HAVE STRAIGHT EDGES

13563 SUPPORT
(SAE-1020 STEEL)


C.L. OF LAMP
6 1/16
10491
6 5/16
10493
13563
C.L. OF SHAFT

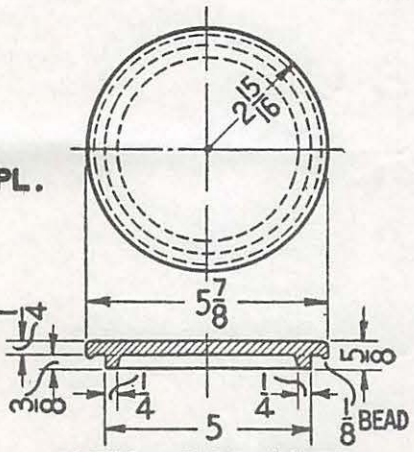
13564 LAMP BRACKET COMPL.




119414
119414
1/2 X 1 1/2 SQ. HD. BOLT WITH HEX. NUT.

FOR FURTHER DETAILS OF BEARING SEE NO'S 1082 AND 1194

13561 DOUBLE BEARING COMPL.
(WITHOUT LAMP BRACKET)

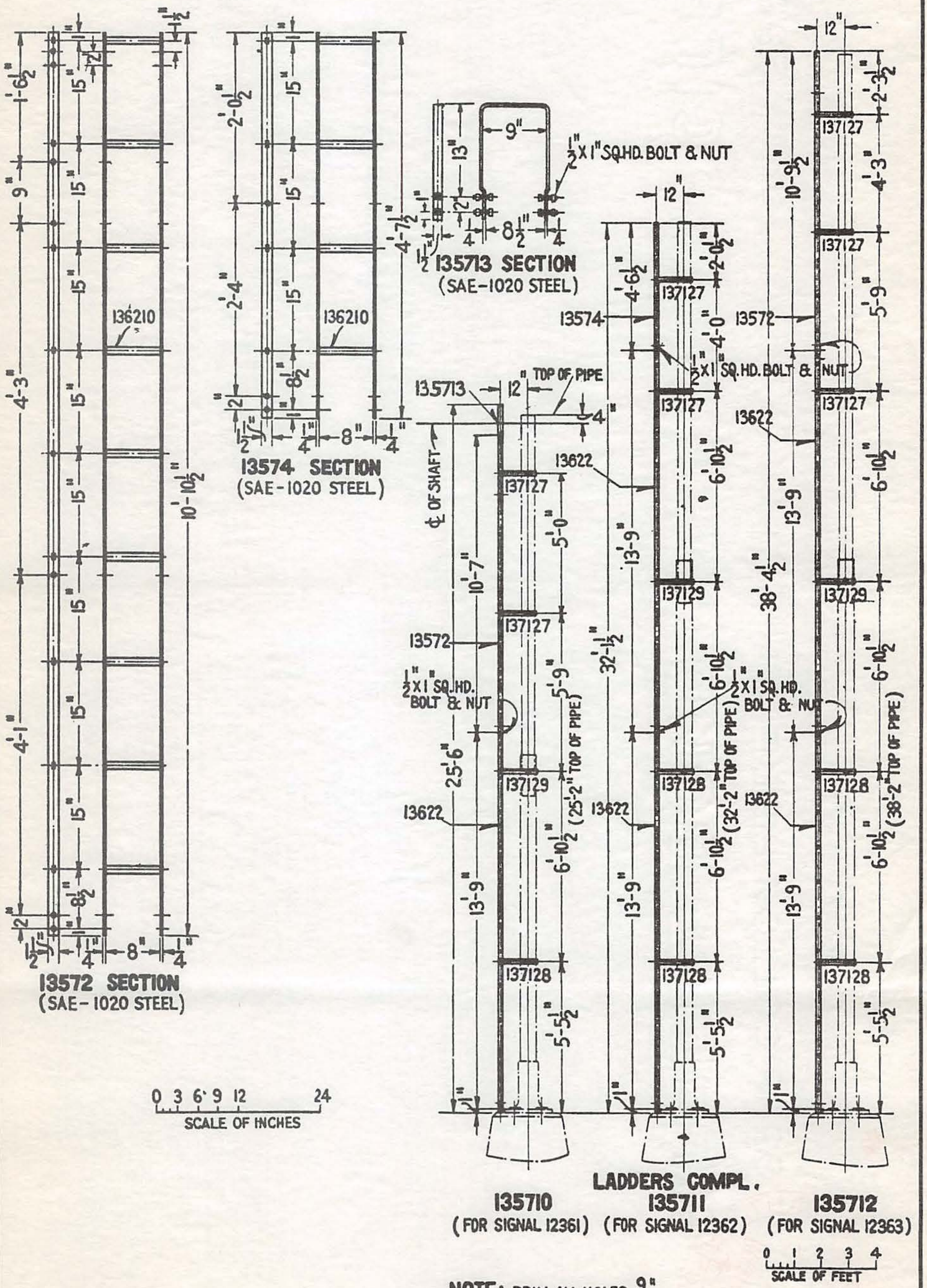

2 15/16
5 7/8
1/4
5/8
3/8
1/4
1/4
5
1/8 BEAD

13562 PIPE COVER
(CAST IRON)

0 3 6 9 12
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

DOUBLE SPECTACLE BEARING AND LAMP BRACKET
(FOR TWO-WAY SINGLE-LAMP SIGNAL)

M-1941	SEP. 1941	MAR. 1916	AAR SIG. SEC. 1356B



1'-6½"
9"
4'-3"
4'-1"
15"
1½"
12"
8½"
2"
½"
4"
8"
136210
10'-10½"
2'-0½"
2'-4"
4'-7½"
13"
9"
½"x1" SQ.HD. BOLT & NUT
8½"
TOP OF PIPE
4"
℄ OF SHAFT
135713
13574
13572
13622
137127
137128
137129
½"x1" SQ.HD. BOLT & NUT
4'-6½"
2'-0½"
4'-0"
6'-10½"
10'-7"
5'-0"
5'-9"
25'-6"
(25'-2" TOP OF PIPE)
(32'-2" TOP OF PIPE)
(38'-2" TOP OF PIPE)
13'-9"
5'-5½"
1"
32'-1½"
38'-4½"
10'-9½"
2'-3½"
4'-3"
0 3 6 9 12 24
SCALE OF INCHES
0 1 2 3 4
SCALE OF FEET

13572 SECTION
(SAE-1020 STEEL)

13574 SECTION
(SAE-1020 STEEL)

135713 SECTION
(SAE-1020 STEEL)

LADDERS COMPL.

135710 (FOR SIGNAL 12361)

135711 (FOR SIGNAL 12362)

135712 (FOR SIGNAL 12363)

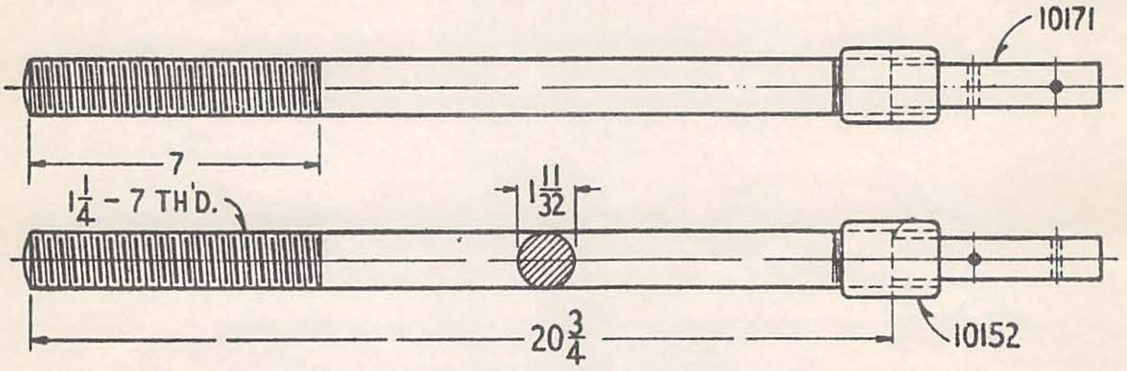
NOTE: DRILL ALL HOLES 9/16".

LADDERS FOR TWO-WAY SINGLE-LAMP SIGNAL

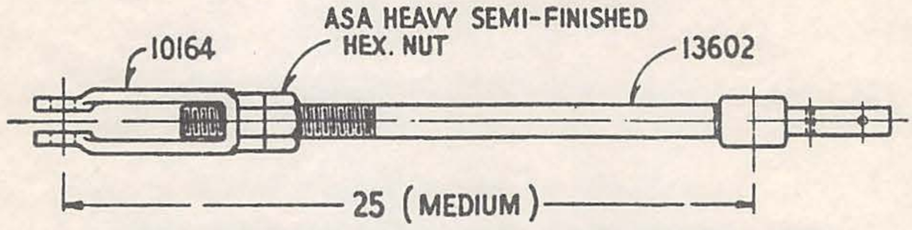
							M-1941	SEP. 1941	MAN-1926	SEP. 1924	MAR. 1916

AAR
SIG. SEC.
1357C

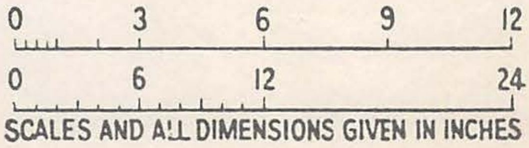
S-374


10171
7
$1\frac{1}{4}$ - 7 TH'D.
$1\frac{11}{32}$
$20\frac{3}{4}$
10152

13602 STRAIGHT THREADED TANG END
SAE-1020 STEEL


ASA HEAVY SEMI-FINISHED
HEX. NUT
10164
13602
25 (MEDIUM)

13605 STRAIGHT TANG END WITH SCREW JAW

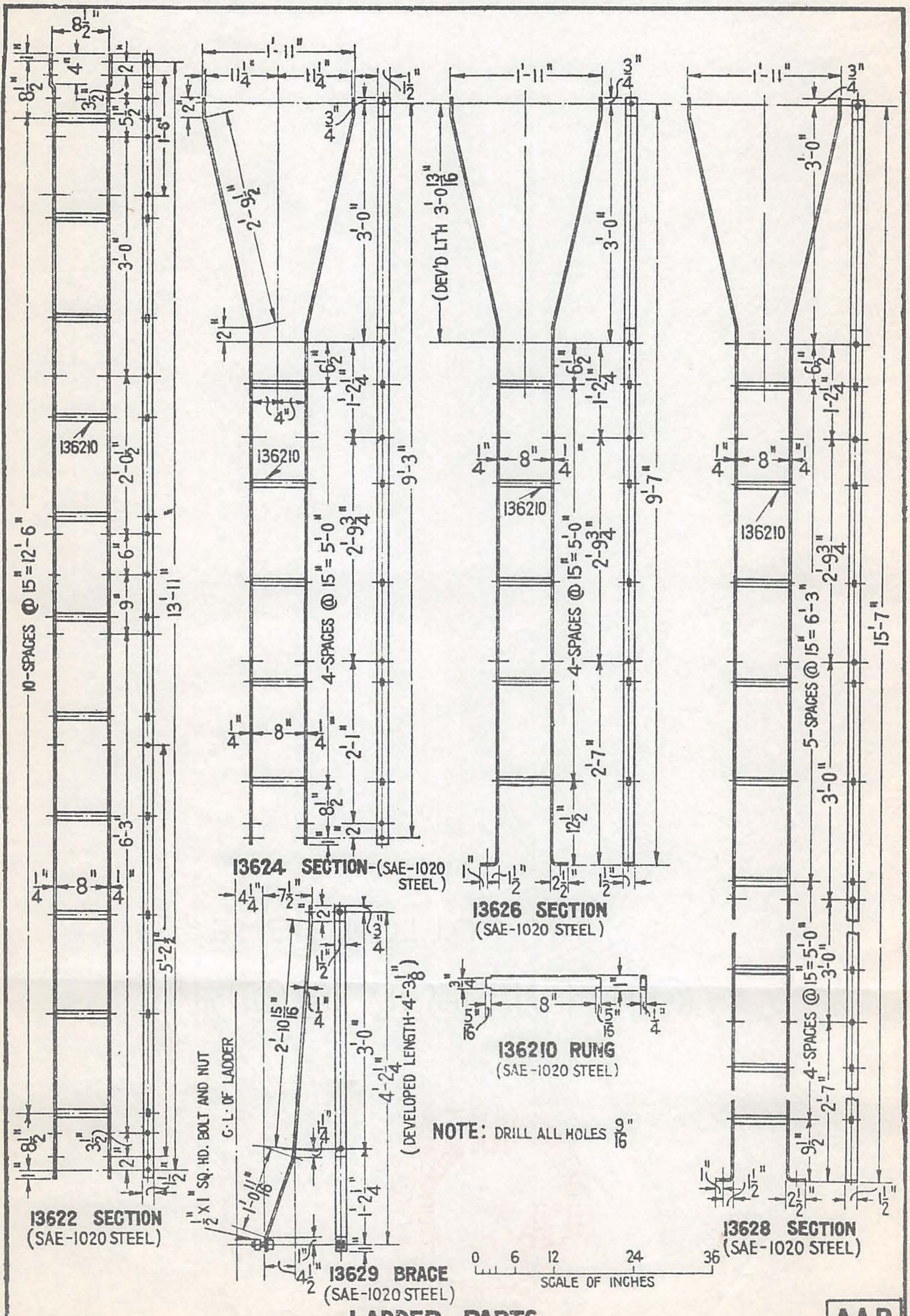

0
3
6
9
12
0
6
12
24

SCALES AND ALL DIMENSIONS GIVEN IN INCHES

S-375

TANG END WITH SCREW JAW

M-1941	SEP. 1941	DEC. 1915	SEP. 1915	MAY 1915	AAR SIG. SEC. 1360B


13622 SECTION
(SAE-1020 STEEL)
10-SPACES @ 15" = 12'-6"
13'-11"
136210
13624 SECTION-(SAE-1020 STEEL)
4-SPACES @ 15" = 5'-0"
9'-3"
(DEV'D LTH 3'-0 13/16")
13626 SECTION
(SAE-1020 STEEL)
9'-7"
13628 SECTION
(SAE-1020 STEEL)
5-SPACES @ 15" = 6'-3"
4-SPACES @ 15" = 5'-0"
15'-7"
13629 BRACE
(SAE-1020 STEEL)
(DEVELOPED LENGTH 4'-3 1/8")
1/2" X 1" SQ. HD. BOLT AND NUT
G·L· OF LADDER
136210 RUNG
(SAE-1020 STEEL)
NOTE: DRILL ALL HOLES 9/16"
0 6 12 24 36
SCALE OF INCHES

LADDER PARTS

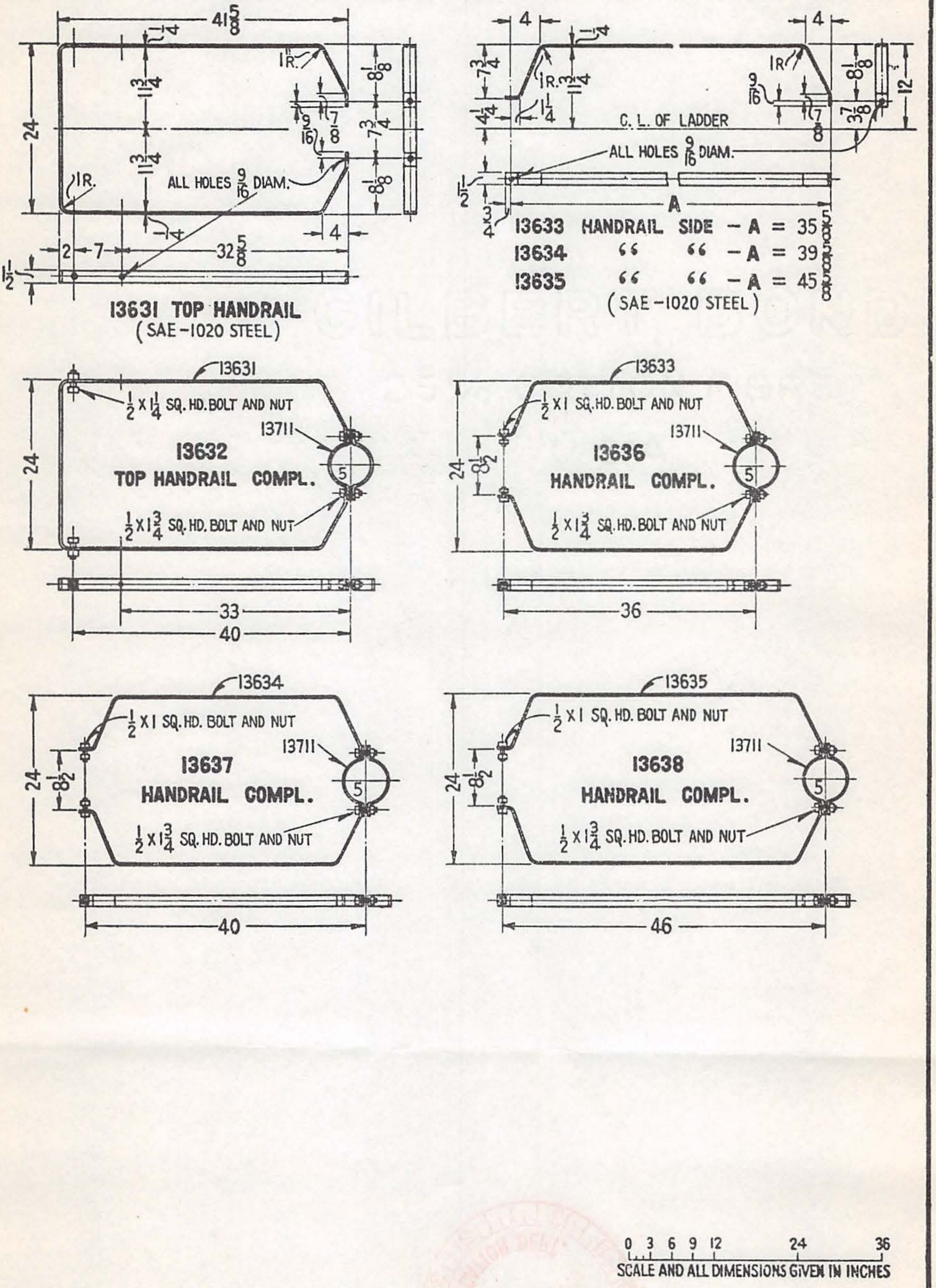
(DETAILS)

M-1941 | SEP. 1941 | M-1926 | SEP. 1925 | DEC. 1918 | MAR. 1918

AAR
SIG. SEC.
1362C

S-376

RECEIVED
FEB 28 1949
SPECIFICATION DEPT.


41 5/8
1 1/4
1" R.
8 1/8
11 3/4
9/16
7/8
24
7 3/4
11 3/4
1 R.
ALL HOLES 9/16 DIAM.
8 1/8
1/4
4
2
7
32 5/8
1/2
13631 TOP HANDRAIL
(SAE-1020 STEEL)
4
4
1/4
7 3/4
1 R.
3/4
11 3/4
1 R.
9/16
8 1/8
12
4 1/4
1 1/4
7/8
3 7/8
C. L. OF LADDER
ALL HOLES 9/16 DIAM.
1/2
4 3/4
A
13633 HANDRAIL SIDE - A = 35 5/8
13634 " " - A = 39 5/8
13635 " " - A = 45 5/8
(SAE-1020 STEEL)
13631
1/2 X 1 1/4 SQ. HD. BOLT AND NUT
13711
13632
TOP HANDRAIL COMPL.
5
24
1/2 X 1 3/4 SQ. HD. BOLT AND NUT
33
40
13633
1/2 X 1 SQ. HD. BOLT AND NUT
13711
13636
HANDRAIL COMPL.
24
8 1/2
5
1/2 X 1 3/4 SQ. HD. BOLT AND NUT
36
13634
1/2 X 1 SQ. HD. BOLT AND NUT
13711
13637
HANDRAIL COMPL.
24
8 1/2
5
1/2 X 1 3/4 SQ. HD. BOLT AND NUT
40
13635
1/2 X 1 SQ. HD. BOLT AND NUT
13711
13638
HANDRAIL COMPL.
24
8 1/2
5
1/2 X 1 3/4 SQ. HD. BOLT AND NUT
46
0 3 6 9 12 24 36
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

S-377

LADDER HANDRAILS

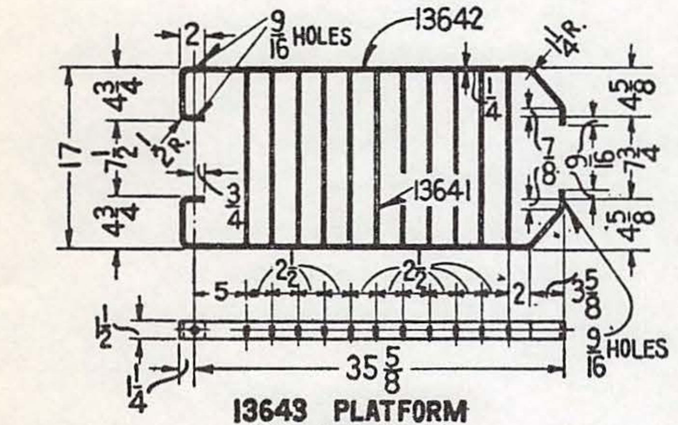
(DETAILS AND ASSEMBLY)

									M-1941	SEP.1941	MAR.1918

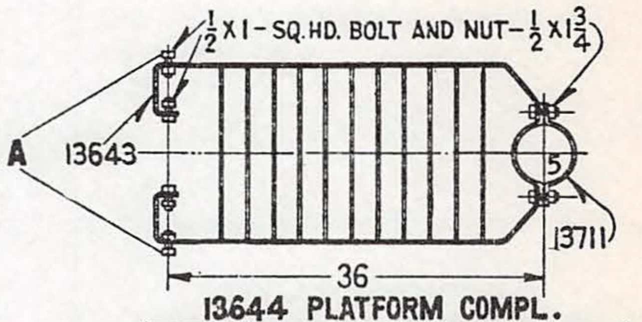
AAR
SIG.SEC.
1363B

RECEIVED
FEB 28 1949
SPECIFICATION DEPT.

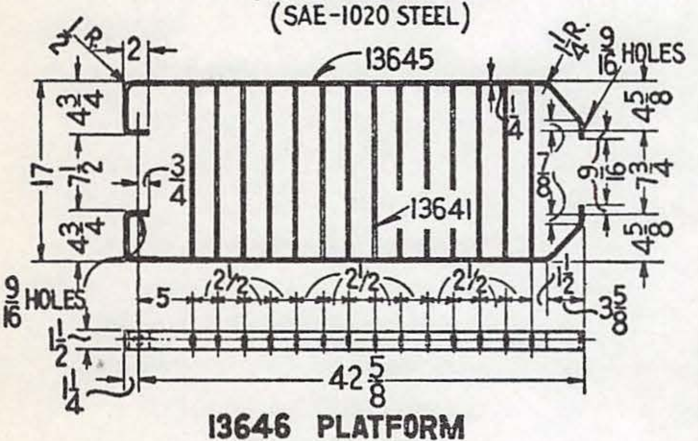
0 3 6 9 12 24 36
SCALE AND ALL DIMENSIONS GIVEN IN INCHES


2
9/16 HOLES
13642
1/4 R.
4 3/4
17
7 1/2
1/2 R.
3/4
4 3/4
1/4
13641
4 5/8
7/8
9/16
7 3/4
4 5/8
5
2 1/2
2 1/2
2
3 5/8
1 1/2
35 5/8
1 1/4
9/16 HOLES

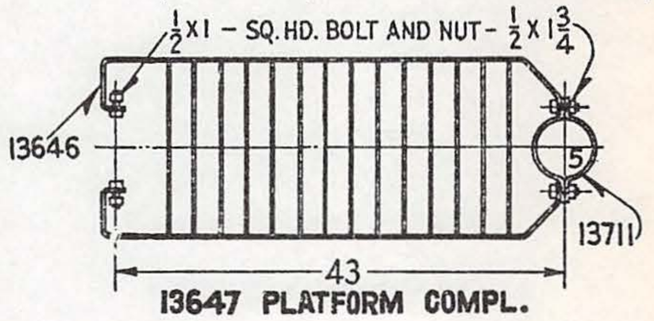
13643 PLATFORM
(SAE-1020 STEEL)


1/2 X 1 - SQ. HD. BOLT AND NUT - 1/2 X 1 3/4
A
13643
5
13711
36

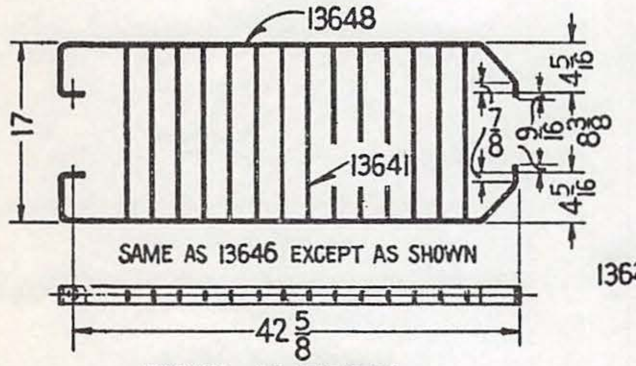
13644 PLATFORM COMPL.
(BOLTS "A" REQUIRED FOR TOP PLATFORM ONLY)


1/4 R.
2
13645
1/4 R.
9/16 HOLES
4 3/4
17
7 1/2
3/4
4 3/4
1/4
13641
7/8
9/16
4 5/8
7 3/4
4 5/8
9/16 HOLES
5
2 1/2
2 1/2
2 1/2
1 1/2
3 5/8
1 1/2
42 5/8
1 1/4

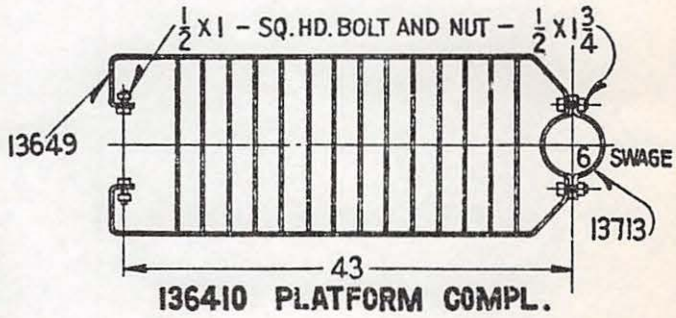
13646 PLATFORM
(SAE-1020 STEEL)


1/2 X 1 - SQ. HD. BOLT AND NUT - 1/2 X 1 3/4
13646
5
13711
43

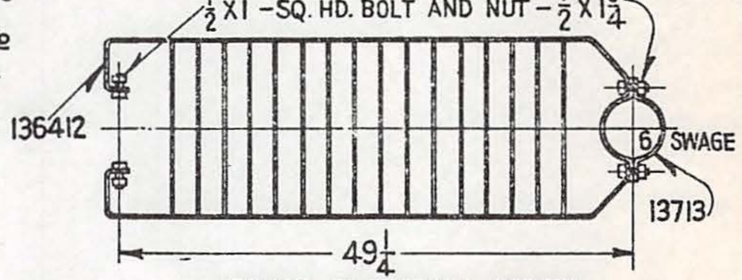
13647 PLATFORM COMPL.


13648
17
4 5/16
7/8
9/16
8 3/8
13641
4 5/16
SAME AS 13646 EXCEPT AS SHOWN
42 5/8

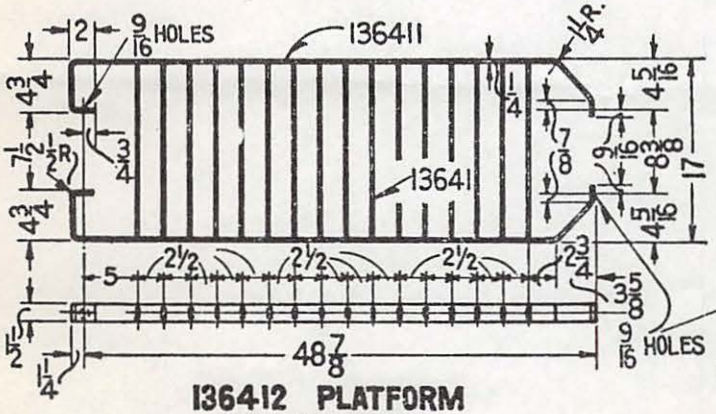
13649 PLATFORM
(SAE-1020 STEEL)


1/2 X 1 - SQ. HD. BOLT AND NUT - 1/2 X 1 3/4
13649
6
SWAGE
13713
43

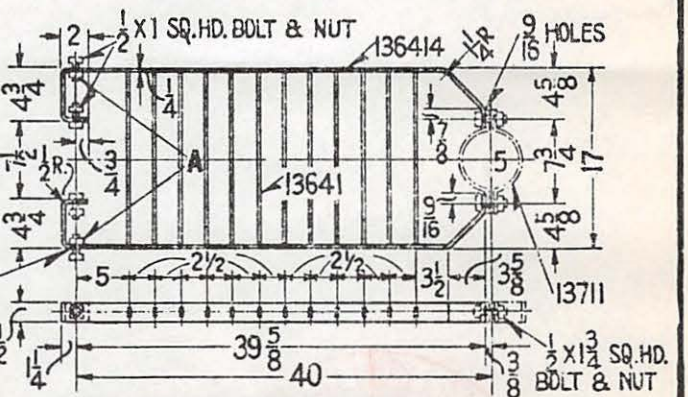
136410 PLATFORM COMPL.


1/2 X 1 -SQ. HD. BOLT AND NUT - 1/2 X 1 3/4
136412
6
SWAGE
13713
49 1/4

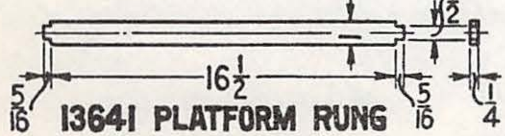
136413 PLATFORM COMPL.


2
9/16 HOLES
136411
1/4 R.
4 3/4
7 1/2
1/2 R.
3/4
4 3/4
1/4
13641
7/8
9/16
8 3/8
17
4 5/16
4 5/16
5
2 1/2
2 1/2
2 1/2
2 3/4
3 5/8
1 1/2
48 7/8
1 1/4
9/16 HOLES

136412 PLATFORM
(SAE-1020 STEEL)


2
1/2 X 1 SQ. HD. BOLT & NUT
136414
1/4 R.
9/16 HOLES
4 3/4
7 1/2
1/2 R.
4 3/4
1/4
3/4
A
7/8
5
13641
9/16
4 5/8
7 3/4
17
4 5/8
5
2 1/2
2 1/2
3 1/2
3 5/8
13711
1 1/2
1 1/4
39 5/8
40
3/8
1/2 X 1 3/4 SQ. HD. BOLT & NUT

136415 PLATFORM ONLY - (SAE-1020 STEEL)
136416 PLATFORM COMPL. (WITH BOLTS & CLAMP
(BOLTS "A" REQUIRED FOR TOP PLATFORM ONLY)


1/2
16 1/2
5/16
5/16
1/4

13641 PLATFORM RUNG
(SAE-1020 STEEL)

S-378

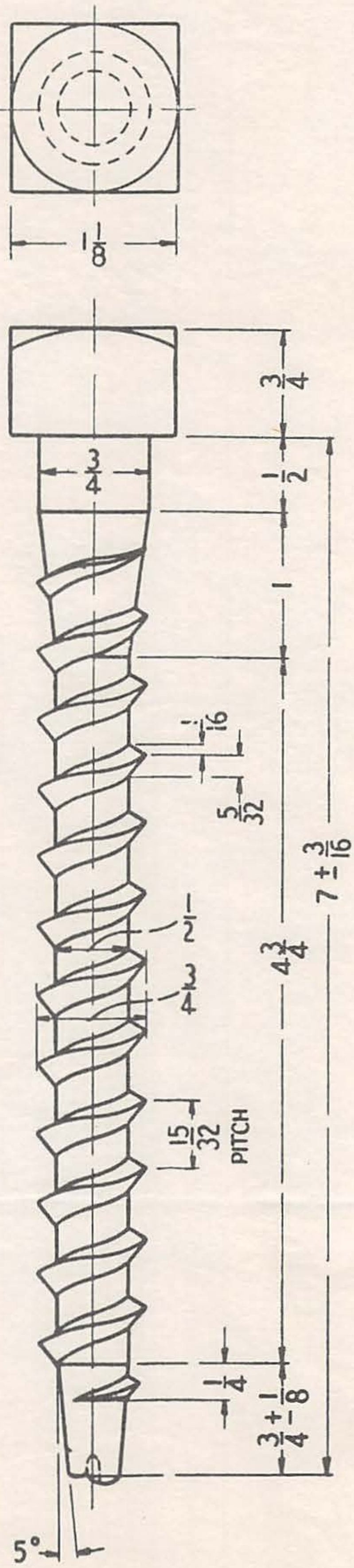
LADDER PLATFORMS
(DETAILS AND ASSEMBLY)

AAR
SIG. SEC.
1364C

M-1941	SEP. 1941	M-1934	MAR 1934	MAR. 1918

S-318

RECEIVED
FEB 28 19
SPECIFICATION DEPT.



MATERIAL

1 - THE STEEL MAY BE MADE BY THE BESSEMER OR OPEN-HEARTH PROCESS

2 - THE HEADS OF THE LAG SCREWS SHALL BE FORMED AND THE THREADS ROLLED AT A TEMPERATURE NOT LESS THAN 1400 DEGREES FAHRENHEIT

PHYSICAL REQUIREMENTS

3 - THE FULL SIZE FINISHED LAG SCREWS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS AS TO TENSILE PROPERTIES ·

TENSILE STRENGTH, POUNDS PER SQUARE INCH 60, 000.

YIELD POINT, POUNDS PER SQUARE INCH 0.5 TENSILE STRENGTH

ELONGATION IN 2 INCHES, 20 PER CENT

0 1 2 3

SCALE AND ALL DIMENSIONS GIVEN IN INCHES

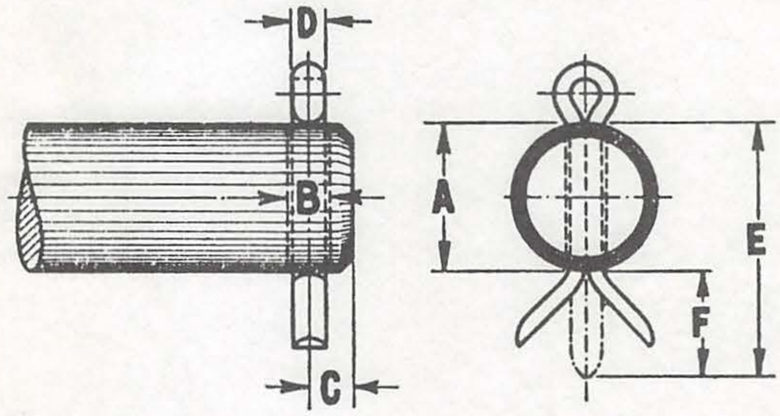
13811 LAG SCREW SPIKE HOT GALVANIZED

LAG SCREW SPIKE

AAR
SIG. SEC.
1381A

M-1941 SEPT. 1941

S-382



NOTE: FIGURES SHOWN IN THE TABLE ARE IN INCHES EXCEPT AS NOTED.

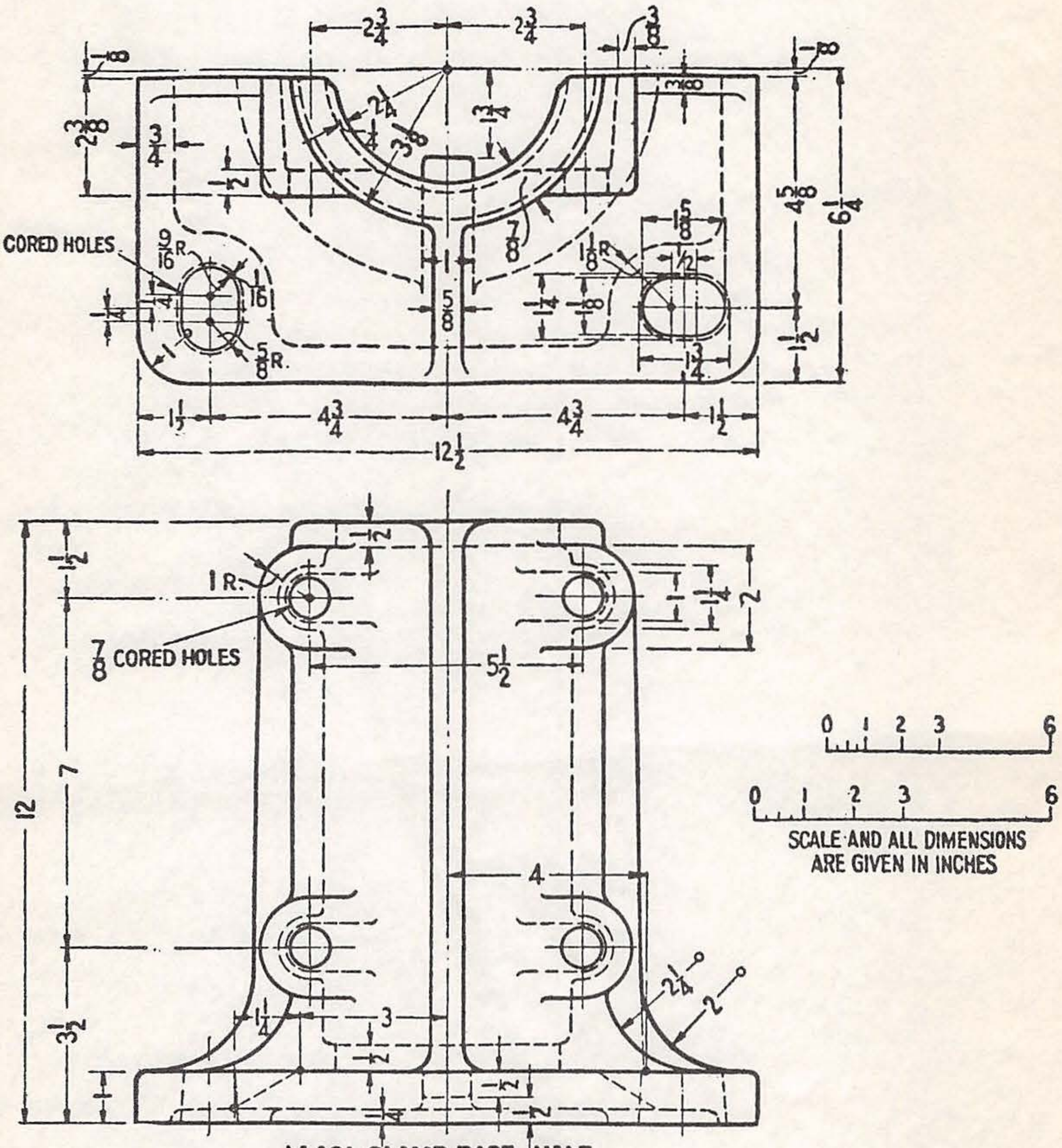
SIZE OF PIN—SHAFT OR BOLT					COTTER REQUIRED					
A	B		C		D			E	F	CLEARANCE BETWEEN HOLE AND COTTER (B−D)
DIAMET'R	DIAMETER OF COTTER HOLE		LOCATION OF COTTER HOLE		DIAMETER OF COTTER			LENGTH (TOTAL)	LENGTH OVER DIAMETER OF SHAFT (E−A)	
					NOMINAL	ACTUAL				
	DRILL NO. OR SIZE	DECIMAL EQUIVALENT	MAXIMUM {RECOMMENDED}	MINIMUM		A.S.& W. GAUGE	DECIMAL EQUIVALENT			
1/8			3/32	5/64						
3/16	№ 49	.073	1/8	3/32	1/16	№ 16	.063	3/8	3/16	.010
1/4	№ 49	.073	1/8	3/32	1/16	№ 16	.063	1/2	1/4	.010
5/16	№ 29	.136	3/16	5/32	1/8	№ 11	.121	3/4	7/16	.015
3/8	№ 29	.136	3/16	5/32	1/8	№ 11	.121	3/4	3/8	.015
7/16	№ 29	.136	3/16	5/32	1/8	№ 11	.121	3/4	5/16	.015
1/2	№ 8	.199	1/4	3/16	3/16	№ 7	.177	1	1/2	.022
5/8	№ 8	.199	1/4	3/16	3/16	№ 7	.177	1 1/4	5/8	.022
3/4	№ 8	.199	1/4	3/16	3/16	№ 7	.177	1 1/4	1/2	.022
7/8	№ 8	.199	1/4	3/16	3/16	№ 7	.177	1 1/2	5/8	.022
1	1/4	.250	3/8	5/16	1/4	№ 4	.225	1 3/4	3/4	.025
1 1/8	1/4	.250	3/8	5/16	1/4	№ 4	.225	1 3/4	5/8	.025
1 1/4	1/4	.250	3/8	5/16	1/4	№ 4	.225	2	3/4	.025
1 3/8	5/16	.313	1/2	3/8	5/16	№ 1	.283	2	5/8	.030
1 1/2	5/16	.313	1/2	3/8	5/16	№ 1	.283	2 1/2	1	.030
1 3/4	5/16	.313	1/2	3/8	5/16	№ 1	.283	2 3/4	1	.030
2	25/64	.390	5/8	1/2	3/8	№ 3/0	.363	3	1	.027
2 1/4	25/64	.390	5/8	1/2	3/8	№ 3/0	.363	3 1/4	1	.027
2 1/2	15/32	.469	3/4	5/8	7/16	№ 5/0	430	3 3/4	1 1/4	.039
2 3/4	15/32	.469	3/4	5/8	7/16	№ 5/0	.430	4	1 1/4	.039
3	1/2	.500	7/8	3/4	1/2	№ 6/0	.460	5	2	.040
3 1/4	1/2	.500	7/8	3/4	1/2	№ 6/0	.460	5	1 3/4	.040
3 1/2	5/8	.625	1	7/8	5/8		.590	6	2 1/2	.035
3 3/4	5/8	.625	1	7/8	5/8		.590	6	2 1/4	.035

COTTERS

(SIZE — DRILLING — LOCATION)

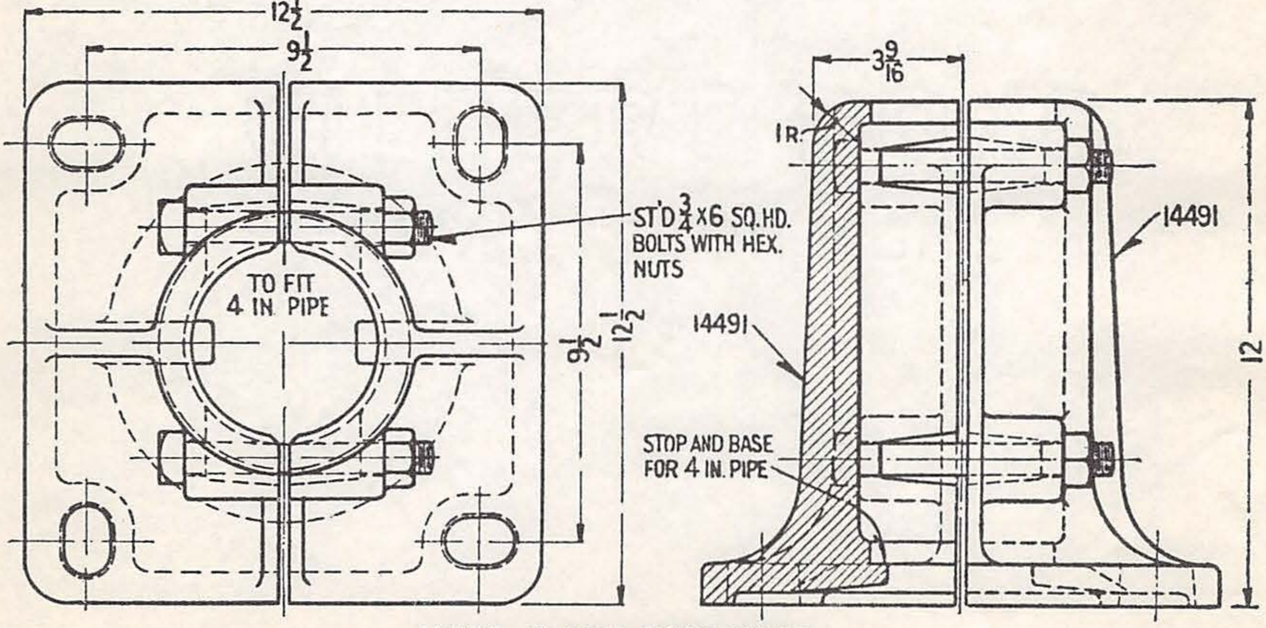
DEC.1919 MAR.1919

SPECIFICATION DEPT.
RECEIVED
JAN 3 19



2¾
2¾
⅜
⅛
⅛
2⅜
¾
½
2¼
3⅜
1¼
⅜
1
7/8
5/8
CORED HOLES
9/16 R.
1/16
¼
¼
5/8 R.
1⅝
1⅛ R.
½
1¼
1⅛
1¾
4⅝
6¼
1½
1½
4¾
4¾
1½
12½
½
1 R.
7/8 CORED HOLES
5½
1
1¼
2
12
1½
7
3½
1
4
1¼
3
½
2¼
2
½
¼
½
0 1 2 3 6
0 1 2 3 6
SCALE AND ALL DIMENSIONS ARE GIVEN IN INCHES

14491 CLAMP BASE—HALF
(CAST IRON)



12½
9½
TO FIT 4 IN. PIPE
ST'D ¾×6 SQ. HD. BOLTS WITH HEX. NUTS
9½
12½
3 9/16
1 R.
14491
14491
STOP AND BASE FOR 4 IN. PIPE
12

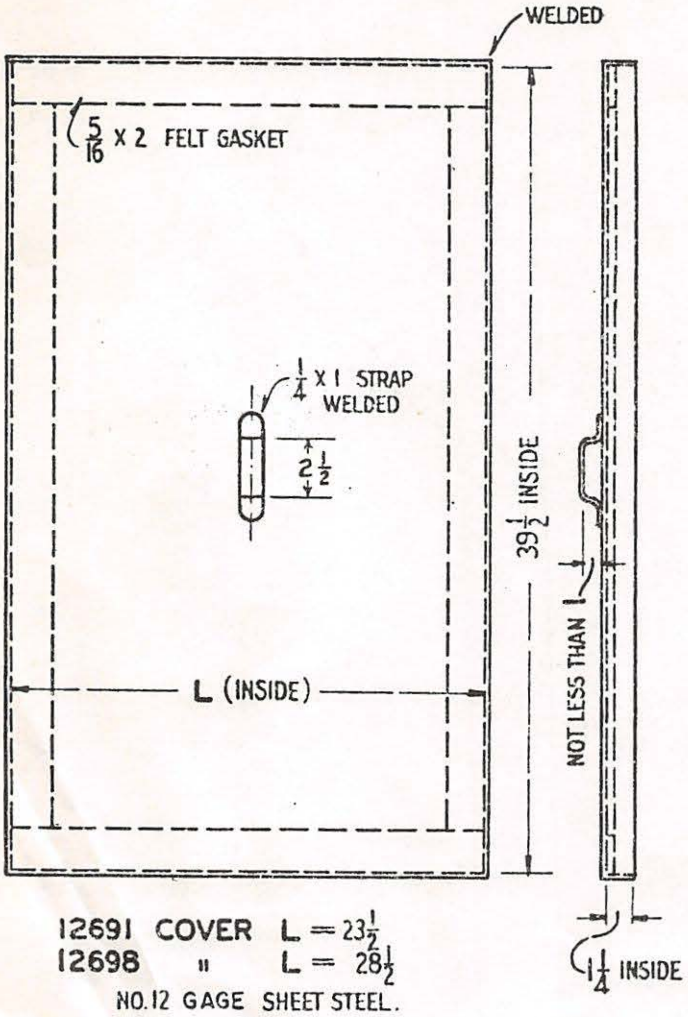
14492 CLAMP BASE COMPL.

BASE FOR 4 INCH MAST

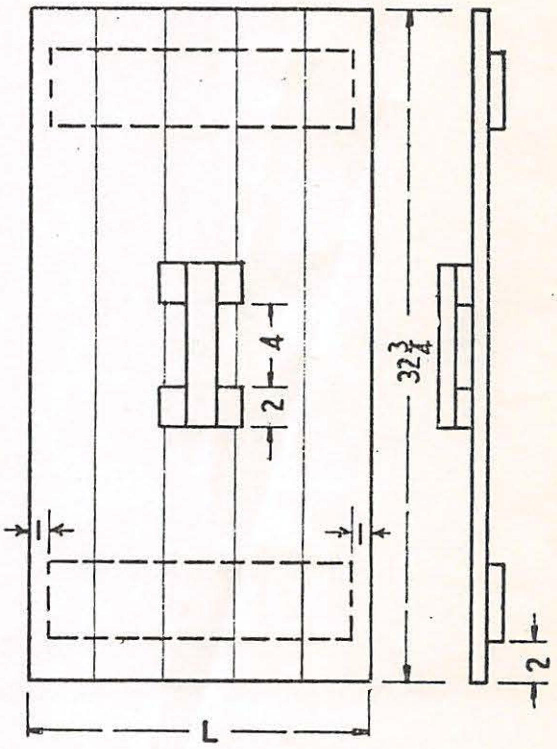
AAR
SIG. SEC.
1449B

M-1939 | MAR.1939 | DEC.1919

S-394

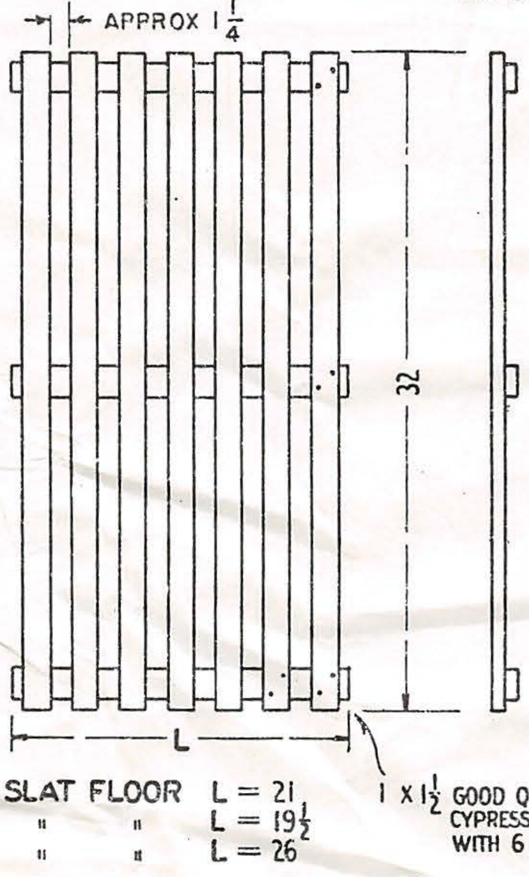

WELDED
5/16 X 2 FELT GASKET
1/4 X 1 STRAP WELDED
2 1/2
L (INSIDE)
39 1/2 INSIDE
NOT LESS THAN 1
1 1/4 INSIDE

12691 COVER L = 23 1/2
12698 " L = 28 1/2
NO.12 GAGE SHEET STEEL.
(0.1046)


4
2
32 3/4
1
1
2
L

12692 FROST BOARD L = 21 3/4
12693 " " L = 19
12694 " " L = AS REQ'D AND WITHOUT HANDLE.

7/8 T.& G. GOOD QUALITY WELL SEASONED CYPRESS, FIR OR WHITE PINE FASTENED WITH 6 d NAILS CLINCHED ON BOTTOM.


APPROX 1 1/4
32
L

NOTE:

NAILS SHALL BE GALVANIZED OR CADMIUM PLATED

0 3 6 9 12 18
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

12695 SLAT FLOOR L = 21
12696 " " L = 19 1/2
12697 " " L = 26

1 X 1 1/2 GOOD QUALITY WELL SEASONED CYPRESS, FIR OR WHITE PINE FASTENED WITH 6 d NAILS CLINCHED ON BOTTOM.

CONCRETE BATTERY BOX
DETAILS

AAR
SIG. SEC.
1269C

					M-1957	SEP-1957	M-1939	MAR.1939	M-1936	MAR.1936

Painting shall be in accordance with Instructions for Painting, Manual Part 110, using two coats of gray finishing paint on top side of cover and two coats of asphaltum paint on under side of cover. All wood parts to have two coats of asphaltum paint.

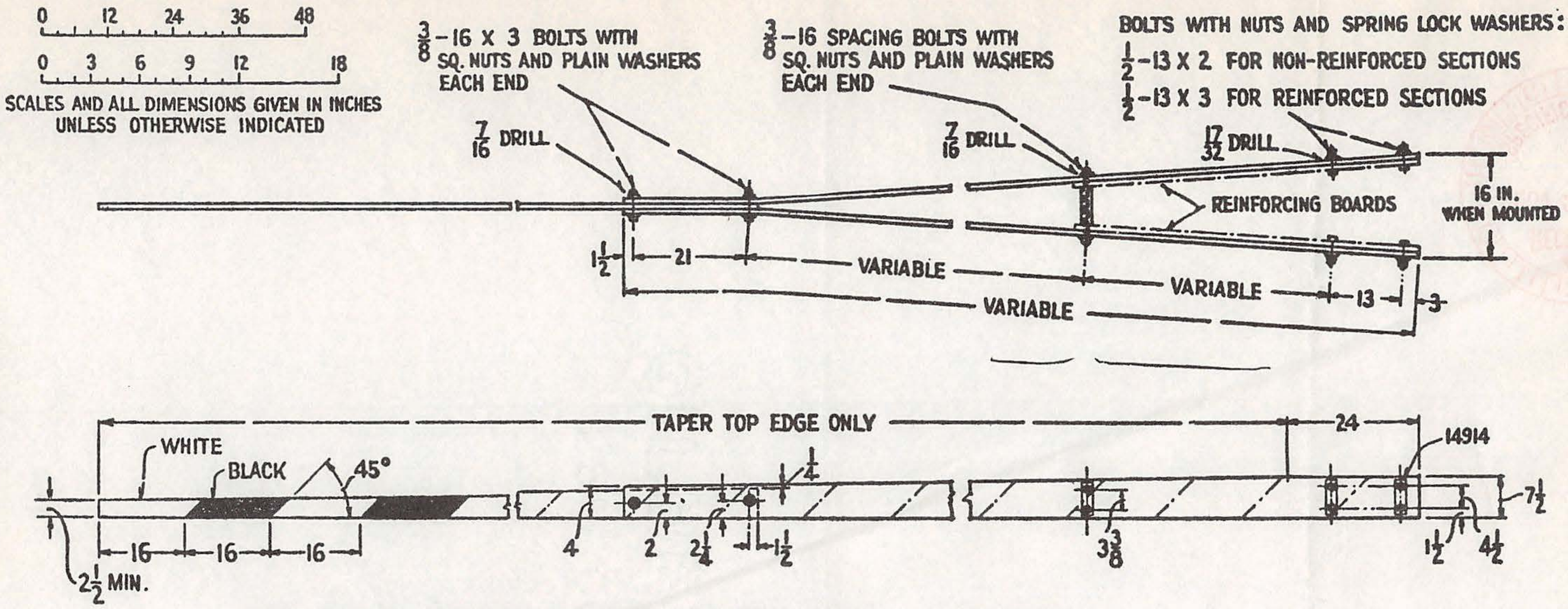
S-369-C

AAR SIG. SEC. 1491D

M-1948	SEPT.-1948	M-1943	OCT.-1943	M-1942	OCT. 1942	M-1940	OCT. 1940

HIGHWAY CROSSING GATE ARM

SCALES AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED



0 12 24 36 48
0 3 6 9 12 18
3/8-16 X 3 BOLTS WITH SQ. NUTS AND PLAIN WASHERS EACH END
3/8-16 SPACING BOLTS WITH SQ. NUTS AND PLAIN WASHERS EACH END
BOLTS WITH NUTS AND SPRING LOCK WASHERS:
1/2-13 X 2 FOR NON-REINFORCED SECTIONS
1/2-13 X 3 FOR REINFORCED SECTIONS
7/16 DRILL
7/16 DRILL
17/32 DRILL
REINFORCING BOARDS
16 IN. WHEN MOUNTED
1 1/2
21
VARIABLE
VARIABLE
13
3
VARIABLE
TAPER TOP EDGE ONLY
24
14914
WHITE
BLACK
45°
1/4
7 1/2
2 1/2 MIN.
16
16
16
4
2
2 1/4
1 1/2
3 3/8
1 1/2
4 1/2

14913 DOUBLE BEARING CROSSING GATE ARM, MAXIMUM LENGTH 38 FT., SPECIFY LENGTH.

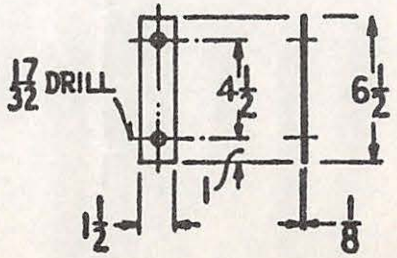
NOTES: ADJUSTABLE CROSS BRACING SHALL BE PROVIDED FOR LENGTHS FROM 25 TO 38 FT.

FOR LENGTHS 35 FT. OR MORE, REINFORCING BOARDS SHALL BE PROVIDED AS SHOWN EXTENDING NOT LESS THAN 8 FT. FROM BUTT ENDS.

LUMBER SHALL BE ONE INCH GRADE 'C' SELECT WHITE PINE OR EQUIVALENT DRESSED FOUR SIDES.

ALL BOLTS, NUTS AND PLAIN WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.

WASHER PLATES, EXCEPT THOSE AT BUTT ENDS SHALL BE OF ALUMINUM.



17/32 DRILL
4 1/2
6 1/2
1
1 1/2
1/8

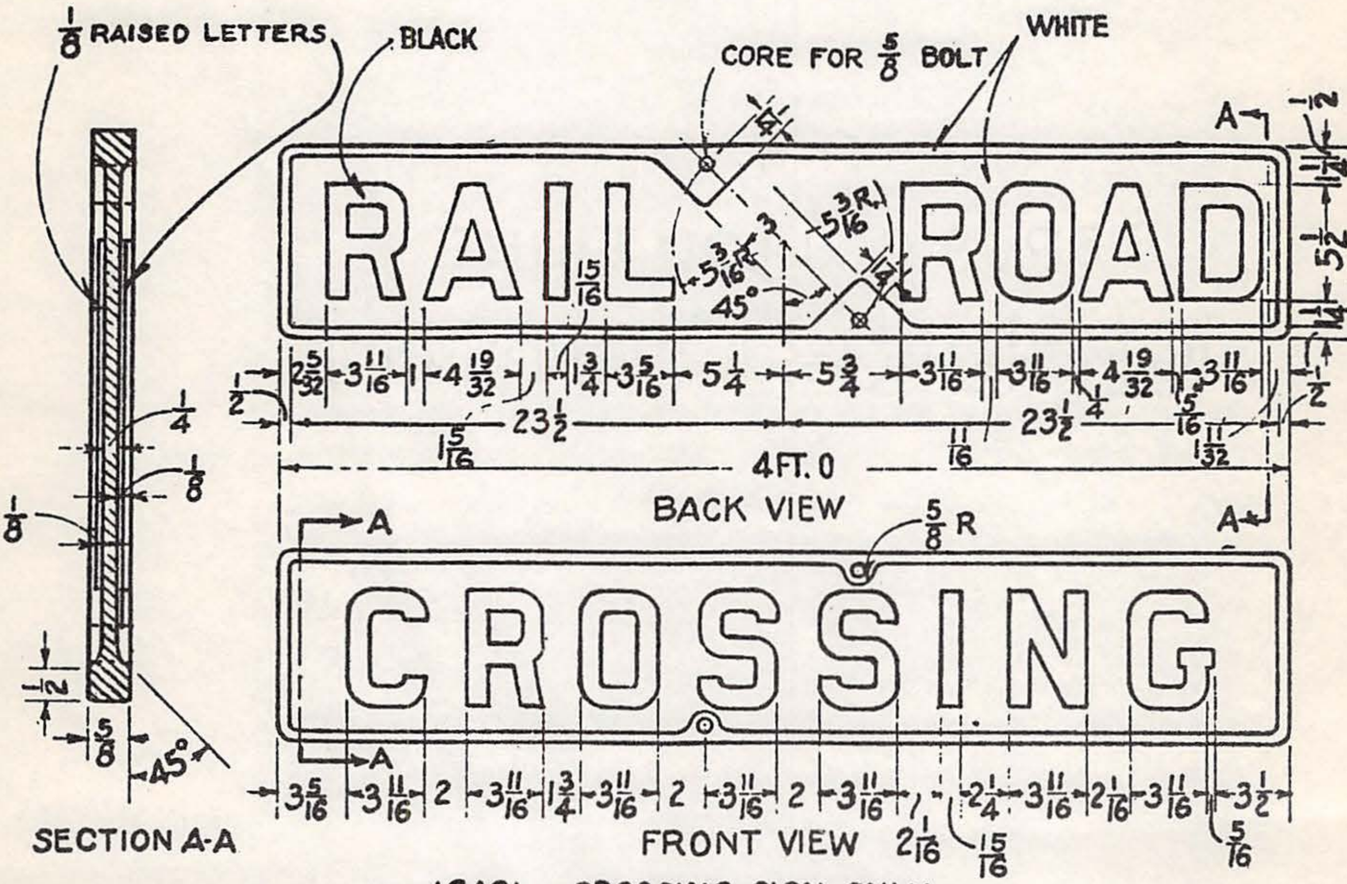
14914 WASHER PLATE

C-1020 STEEL

GALVANIZED OR CADMIUM PLATED

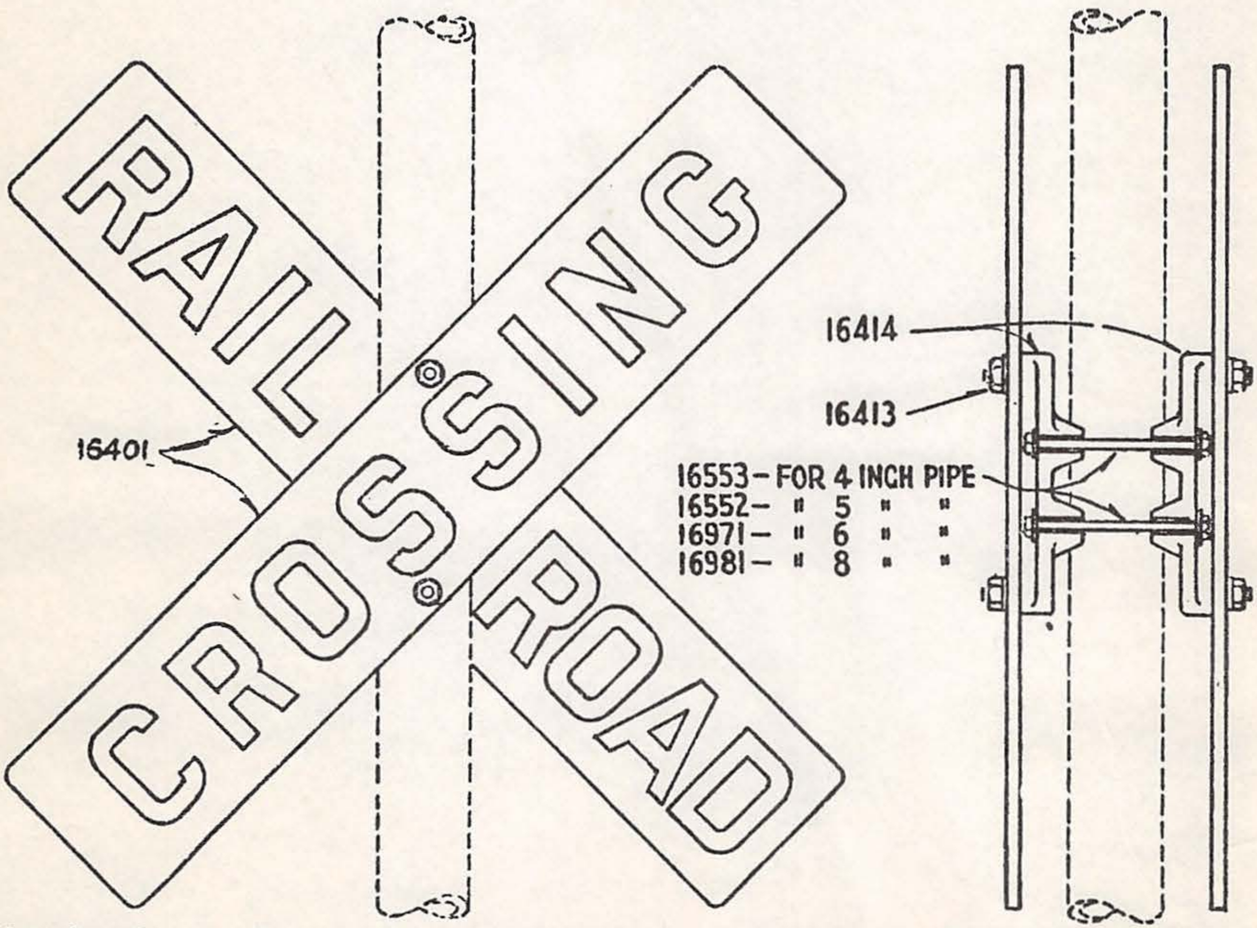
RECEIVED
NOV 25 1949
SPECIFICATION DEPT.

S-413



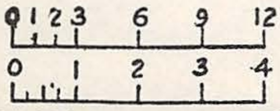
1/8 RAISED LETTERS
BLACK
CORE FOR 5/8 BOLT
WHITE
A
1/2
1 1/4
5 1/2
9
1 1/4
RAIL
ROAD
15/16
5 3/16
3
5 3/16 R
45°
2 5/32
3 11/16
1
4 19/32
1 3/4
3 5/16
5 1/4
5 3/4
3 11/16
3 11/16
4 19/32
3 11/16
1/2
1/2
23 1/2
23 1/2
1 5/16
11/16
1/4
5/16
1 11/32
4 FT. 0
BACK VIEW
5/8 R
A
A
CROSSING
3 5/16
3 11/16
2
3 11/16
1 3/4
3 11/16
2
3 11/16
2
3 11/16
2 1/4
3 11/16
2 1/16
3 11/16
3 1/2
2 1/16
15/16
5/16
FRONT VIEW
1/4
1/8
1/8
1/2
5/8
45°
SECTION A-A

16401 CROSSING SIGN ONLY
CAST IRON



RAIL
ROAD
CROSSING
16401
16414
16413
16553 – FOR 4 INCH PIPE
16552 – " 5 " "
16971 – " 6 " "
16981 – " 8 " "

16404 CROSSING SIGN COMPLETE FOR (SPECIFY PIPE SIZE)



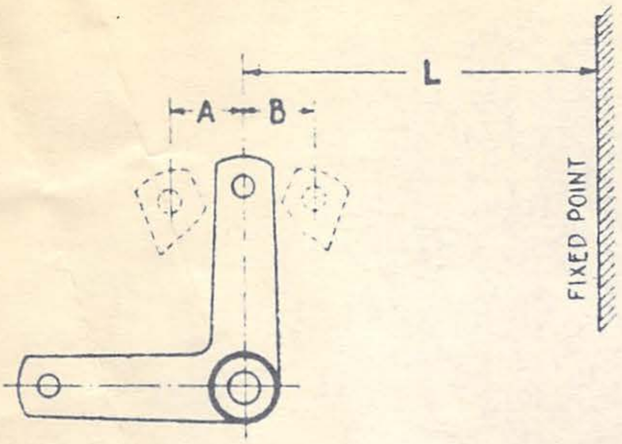
0 1 2 3 6 9 12
0 1 2 3 4

SCALES AND ALL DIMENSIONS GIVEN IN INCHES
UNLESS OTHERWISE SHOWN

90° CAST-IRON CROSSING SIGN

AAR
SIG. SEC
16400

M-1947	SEP. 1947	M-1937	MAR 1937	M-1933	MAY 1933



DIRECTIONS FOR USING

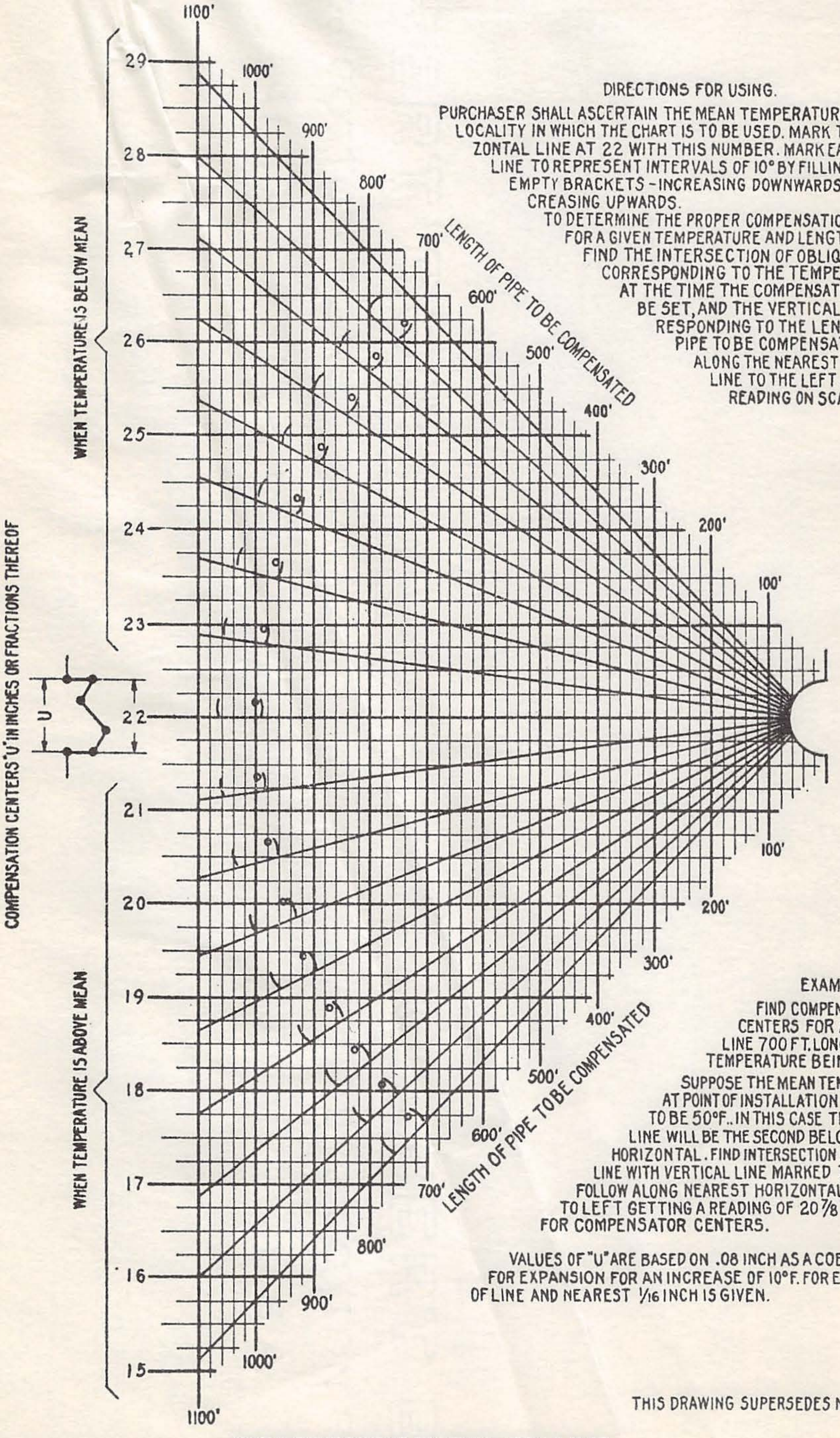
WRITE THE MEAN TEMPERATURE (IN F DEGREES) FOR LOCALITY IN WHICH THE CHART IS TO BE USED, IN DEGREE COLUMN OPPOSITE "MEAN TEMPERATURE", GRADUATING 10° FOR EACH SPACE, INCREASING UPWARD AND DECREASING DOWNWARD. THE FIGURE IN SQUARE OPPOSITE TEMPERATURE AT TIME OF INSTALLATION AND UNDER THE NUMBER OF FEET (L), BETWEEN CRANK AND FIXED POINT, IS THE DISTANCE (A OR B), IN INCHES, THE CRANK SHOULD BE SET TOWARDS OR AWAY FROM THE FIXED POINT.

F°	20'	40'	60'	80'	100'	120'	140'	160'	180'	200'	220'	240'	260'	280'	300'	L
°	1/8	5/16	1/2	5/8	13/16	15/16	1 1/8	1 1/4	1 7/16	1 5/8	1 3/4	1 15/16	2 1/16	2 1/4	2 3/8	A - AWAY FROM FIXED POINT
°	1/8	1/4	7/16	9/16	3/4	7/8	1	1 1/8	1 1/4	1 7/16	1 9/16	1 3/4	1 7/8	2	2 3/16	
°	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 7/16	1 9/16	1 11/16	1 13/16	1 15/16	
°	1/8	1/4	5/16	7/16	9/16	11/16	13/16	7/8	1	1 1/8	1 1/4	1 3/8	1 7/16	1 9/16	1 11/16	
°	1/8	3/16	5/16	3/8	1/2	9/16	11/16	3/4	7/8	15/16	1 1/16	1 1/8	1 1/4	1 3/8	1 7/16	
°	1/16	3/16	1/4	5/16	3/8	1/2	9/16	5/8	3/4	13/16	7/8	15/16	1 1/16	1 1/8	1 3/16	
°	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	
°	1/16	1/8	1/8	3/16	1/4	5/16	5/16	3/8	7/16	1/2	1/2	9/16	5/8	11/16	3/4	
°	1/16	1/16	1/8	1/8	3/16	3/16	1/4	1/4	5/16	5/16	3/8	3/8	7/16	7/16	1/2	
°	1/16	1/16	1/16	1/16	1/16	1/8	1/8	1/8	1/8	3/16	3/16	3/16	3/16	1/4	1/4	
°	← MEAN TEMPERATURE →															
°	1/16	1/16	1/16	1/16	1/16	1/8	1/8	1/8	1/8	3/16	3/16	3/16	3/16	1/4	1/4	B - TOWARDS FIXED POINT
°	1/16	1/16	1/8	1/8	3/16	3/16	1/4	1/4	5/16	5/16	3/8	3/8	7/16	7/16	1/2	
°	1/16	1/8	1/8	3/16	1/4	5/16	5/16	3/8	7/16	1/2	1/2	9/16	5/8	11/16	3/4	
°	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	
°	1/16	3/16	1/4	5/16	3/8	1/2	9/16	5/8	3/4	13/16	7/8	15/16	1 1/16	1 1/8	1 3/16	
°	1/8	3/16	5/16	3/8	1/2	9/16	11/16	3/4	7/8	15/16	1 1/16	1 1/8	1 1/4	1 3/8	1 7/16	
°	1/8	1/4	5/16	7/16	9/16	11/16	13/16	7/8	1	1 1/8	1 1/4	1 3/8	1 7/16	1 9/16	1 11/16	
°	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 7/16	1 9/16	1 11/16	1 13/16	1 15/16	
°	1/8	1/4	7/16	9/16	3/4	7/8	1	1 1/8	1 1/4	1 7/16	1 9/16	1 3/4	1 7/8	2	2 3/16	
°	1/8	5/16	1/2	5/8	13/16	15/16	1 1/8	1 1/4	1 7/16	1 5/8	1 3/4	1 15/16	2 1/16	2 1/4	2 3/8	

S-406

CRANK CHART

MAN'L 1923 | MARCH 1922 | 1538



DIRECTIONS FOR USING.

PURCHASER SHALL ASCERTAIN THE MEAN TEMPERATURE OF THE LOCALITY IN WHICH THE CHART IS TO BE USED. MARK THE HORIZONTAL LINE AT 22 WITH THIS NUMBER. MARK EACH OBLIQUE LINE TO REPRESENT INTERVALS OF 10° BY FILLING IN THE EMPTY BRACKETS - INCREASING DOWNWARDS AND DECREASING UPWARDS.

TO DETERMINE THE PROPER COMPENSATION CENTERS FOR A GIVEN TEMPERATURE AND LENGTH OF PIPE: FIND THE INTERSECTION OF OBLIQUE LINE CORRESPONDING TO THE TEMPERATURE AT THE TIME THE COMPENSATOR IS TO BE SET, AND THE VERTICAL LINE CORRESPONDING TO THE LENGTH OF PIPE TO BE COMPENSATED. FOLLOW ALONG THE NEAREST HORIZONTAL LINE TO THE LEFT AND GET READING ON SCALE.

EXAMPLE:

FIND COMPENSATOR CENTERS FOR A PIPE LINE 700 FT. LONG, THE TEMPERATURE BEING 70°F.

SUPPOSE THE MEAN TEMPERATURE AT POINT OF INSTALLATION IS FOUND TO BE 50°F.. IN THIS CASE THE 70° LINE WILL BE THE SECOND BELOW THE HORIZONTAL. FIND INTERSECTION OF THIS LINE WITH VERTICAL LINE MARKED 700 FT., FOLLOW ALONG NEAREST HORIZONTAL LINE TO LEFT GETTING A READING OF 20 7/8 INCHES FOR COMPENSATOR CENTERS.

VALUES OF "U" ARE BASED ON .08 INCH AS A COEFFICIENT FOR EXPANSION FOR AN INCREASE OF 10°F. FOR EACH 100 FT. OF LINE AND NEAREST 1/16 INCH IS GIVEN.

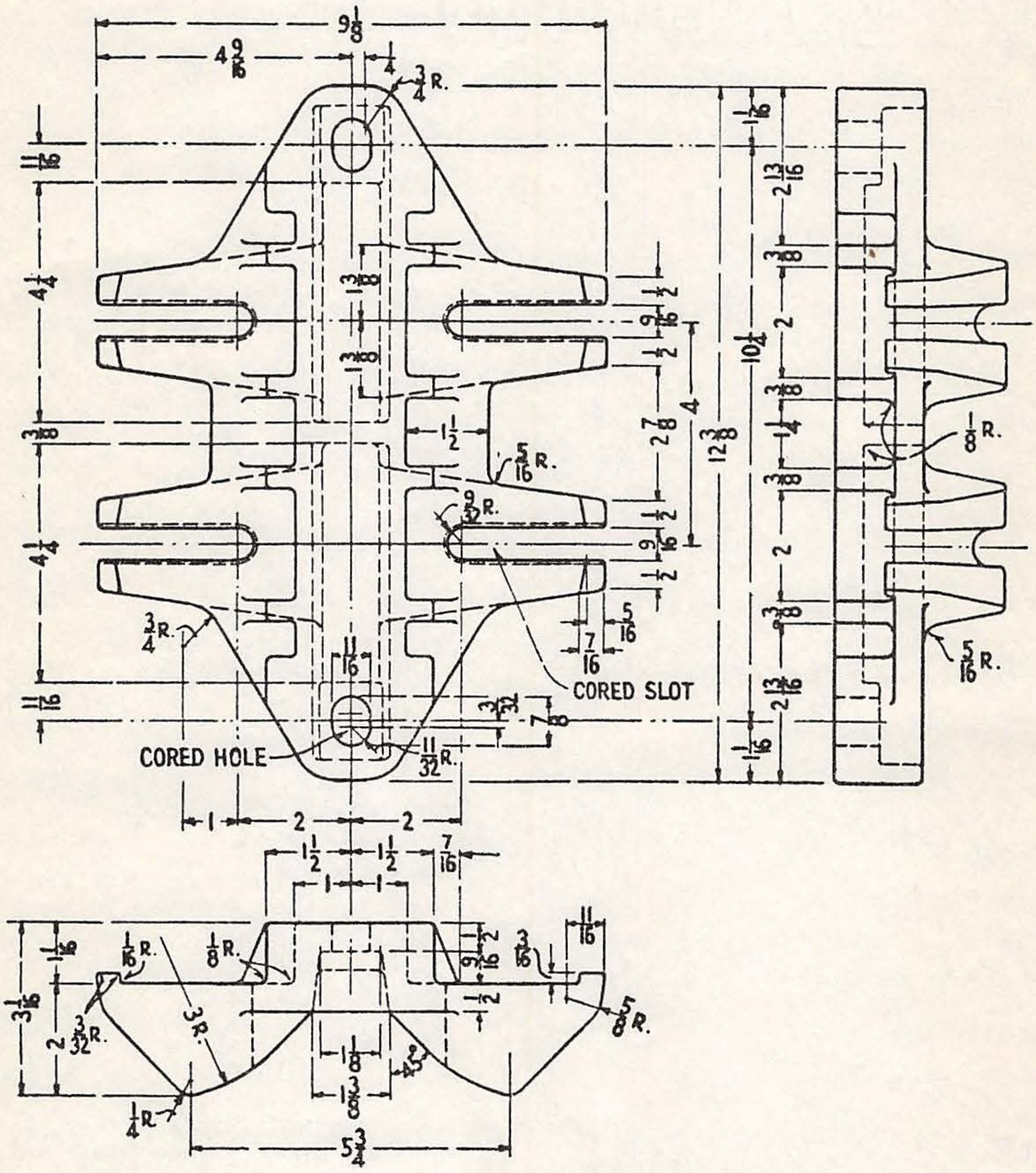
THIS DRAWING SUPERSEDES No. 1102

S-405

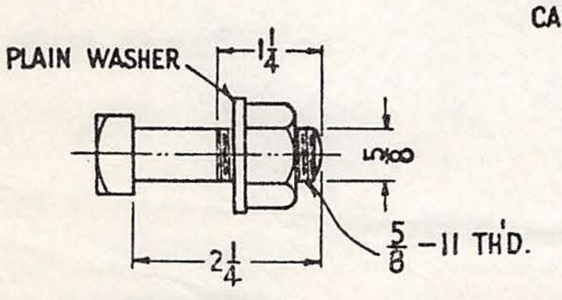
COMPENSATION CHART

MAN'L 1923 | MARCH 1922 | OCT. 1919 | SEPT. 1919 | DEC 1917 | OCT. 1917 | MANUAL - MARCH 1913 | OCT. 1909

1537

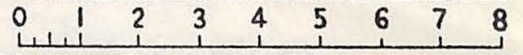

9 1/8
4 9/16
1/4
3/4 R.
11/16
4 1/4
3 1/8
4 1/4
11/16
1 3/8
1 3/8
1 1/2
5/16 R.
9/32 R.
1/2
9/16
1/2
2 7/8
4
12 3/8
10 1/4
1/16
2 13/16
3/8
2
3/8
1 1/4
3/8
2
3/8
2 13/16
1/16
1/8 R.
5/16 R.
5/16
7/16
CORED SLOT
11/16
3/32
7/8
11/32 R.
CORED HOLE
3/4 R.
1
2
2
1 1/2
1 1/2
7/16
1
1
11/16
1/16 R.
1/8 R.
9/16
1/2
3/16
3 1/16
2
3/32 R.
3 R.
1/2
5/8 R.
1 1/8
1 3/8
45°
1/4 R.
5 3/4

16414 ADAPTER CLAMP,
CAST IRON.


PLAIN WASHER
1 1/4
5/8
2 1/4
5/8 -11 TH'D.

16413 BOLT

BOLT, NUT AND WASHER SHALL BE GALVANIZED OR CADMIUM PLATED. GALVANIZING OR CADMIUM PLATING SHALL BE DONE AFTER THREADS HAVE BEEN CUT.


0 1 2 3 4 5 6
0 1 2 3 4 5 6 7 8

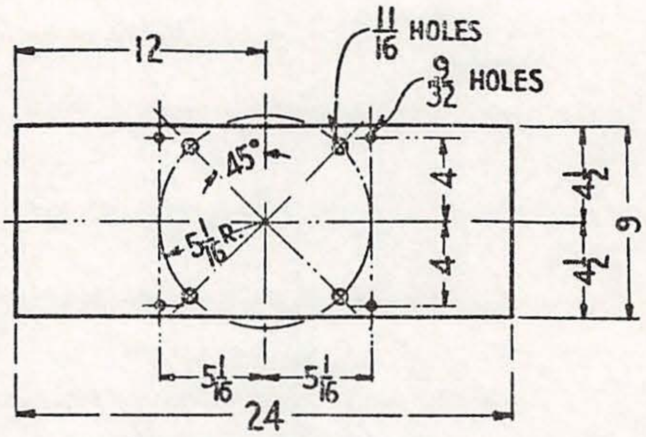
SCALES AND ALL DIMENSIONS GIVEN IN INCHES

DOUBLE ADAPTER CLAMP AND DETAILS FOR CROSSING SIGNS

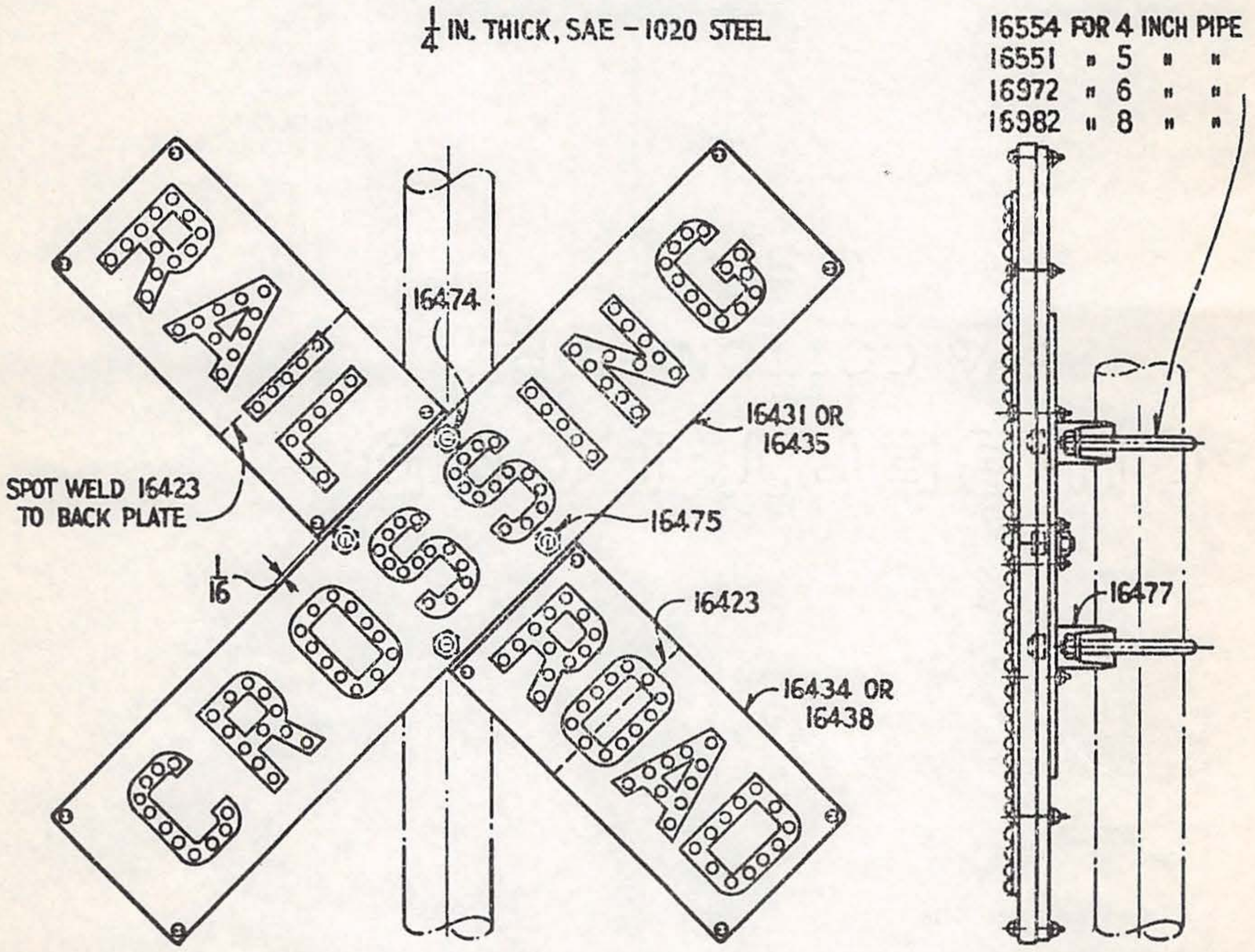
FOR 4 TO 8 INCH PIPE

						M-1947	SEP. 1947	M-1937	MAR. 1937	M-1933	MAY 1933

AAR
SIG. SEC.
1641C


12
11/16 HOLES
9/32 HOLES
45°
5 1/16 R
4
4
4 1/2
4 1/2
9
5 1/16
5 1/16
24

16423 SUPPORTING PLATE
1/4 IN. THICK, SAE – 1020 STEEL


16554 FOR 4 INCH PIPE
16551 " 5 " "
16972 " 6 " "
16982 " 8 " "
RAILROAD
CROSSING
16474
16431 OR
16435
SPOT WELD 16423
TO BACK PLATE
16475
1/16
16423
16434 OR
16438
16477

16428 RAILROAD CROSSING SIGN COMPLETE, SYNTHETIC ENAMEL FINISH
FOR (SPECIFY PIPE SIZE).
16429 RAILROAD CROSSING SIGN COMPLETE, VITREOUS ENAMEL FINISH
FOR (SPECIFY PIPE SIZE).

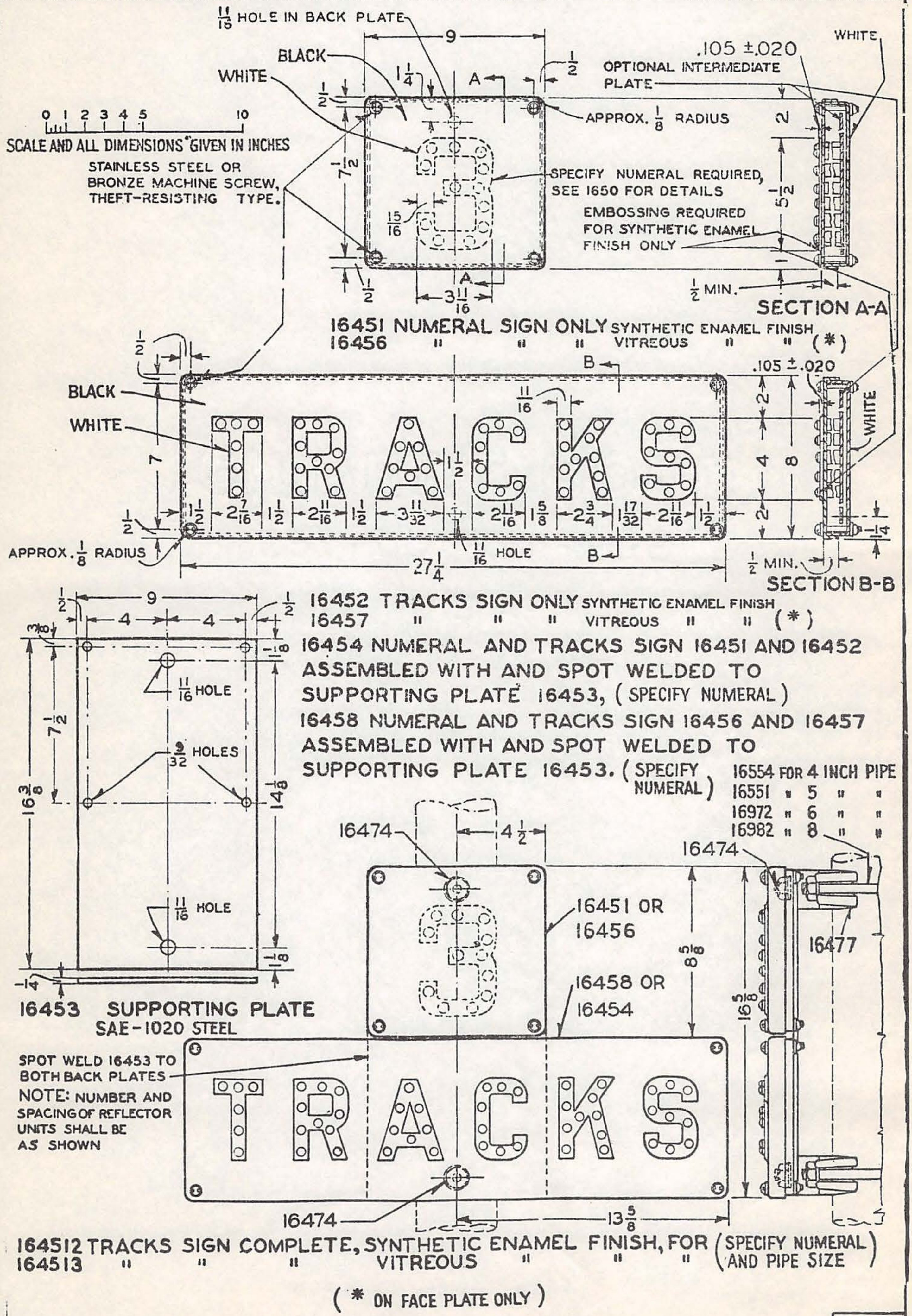
0 6 12 24
SCALE AND ALL DIMENSIONS GIVEN IN INCHES

90° REFLECTOR CROSSING SIGN ASSEMBLY

AAR
SIG. SEC.
1642D

M-1947 SEP.1947 M-1942 OCT.1942 M-1937 MAR.1937 M-1933 MAY 1933

S-416


11/16 HOLE IN BACK PLATE
BLACK
WHITE
9
1 1/4
A
1/2
.105 ±.020
WHITE
OPTIONAL INTERMEDIATE PLATE
0 1 2 3 4 5 10
SCALE AND ALL DIMENSIONS GIVEN IN INCHES
STAINLESS STEEL OR BRONZE MACHINE SCREW, THEFT-RESISTING TYPE.
1/2
7 1/2
APPROX. 1/8 RADIUS
2
SPECIFY NUMERAL REQUIRED, SEE 1650 FOR DETAILS
5 1/2
EMBOSSING REQUIRED FOR SYNTHETIC ENAMEL FINISH ONLY
15/16
1
1/2
3 11/16
1/2 MIN.
SECTION A-A
1/2
B
.105 ±.020
BLACK
WHITE
11/16
TRACKS
7
1 1/2
2
4
8
1 1/2
2 7/16
1 1/2
2 11/16
1 1/2
3 11/32
2 11/16
1 5/8
2 3/4
1 17/32
2 11/16
1 1/2
1/2
1 1/4
APPROX. 1/8 RADIUS
11/16 HOLE
B
27 1/4
1/2 MIN.
SECTION B-B
1/2
9
4
4
1/2
3/8
1/8
11/16 HOLE
7 1/2
9/32 HOLES
16 3/8
14 1/8
11/16 HOLE
1/8
1/4
16474
4 1/2
16474
16451 OR 16456
8 5/8
16477
16458 OR 16454
16 5/8
TRACKS
16474
13 5/8

16451 NUMERAL SIGN ONLY SYNTHETIC ENAMEL FINISH
16456 " " " VITREOUS " " (*)

16452 TRACKS SIGN ONLY SYNTHETIC ENAMEL FINISH
16457 " " " VITREOUS " " (*)

16454 NUMERAL AND TRACKS SIGN 16451 AND 16452 ASSEMBLED WITH AND SPOT WELDED TO SUPPORTING PLATE 16453, (SPECIFY NUMERAL)

16458 NUMERAL AND TRACKS SIGN 16456 AND 16457 ASSEMBLED WITH AND SPOT WELDED TO SUPPORTING PLATE 16453. (SPECIFY NUMERAL)

16554 FOR 4 INCH PIPE
16551 " 5 " "
16972 " 6 " "
16982 " 8 " "

16453 SUPPORTING PLATE
SAE-1020 STEEL

SPOT WELD 16453 TO BOTH BACK PLATES

NOTE: NUMBER AND SPACING OF REFLECTOR UNITS SHALL BE AS SHOWN

164512 TRACKS SIGN COMPLETE, SYNTHETIC ENAMEL FINISH, FOR (SPECIFY NUMERAL AND PIPE SIZE)
164513 " " " VITREOUS " " "

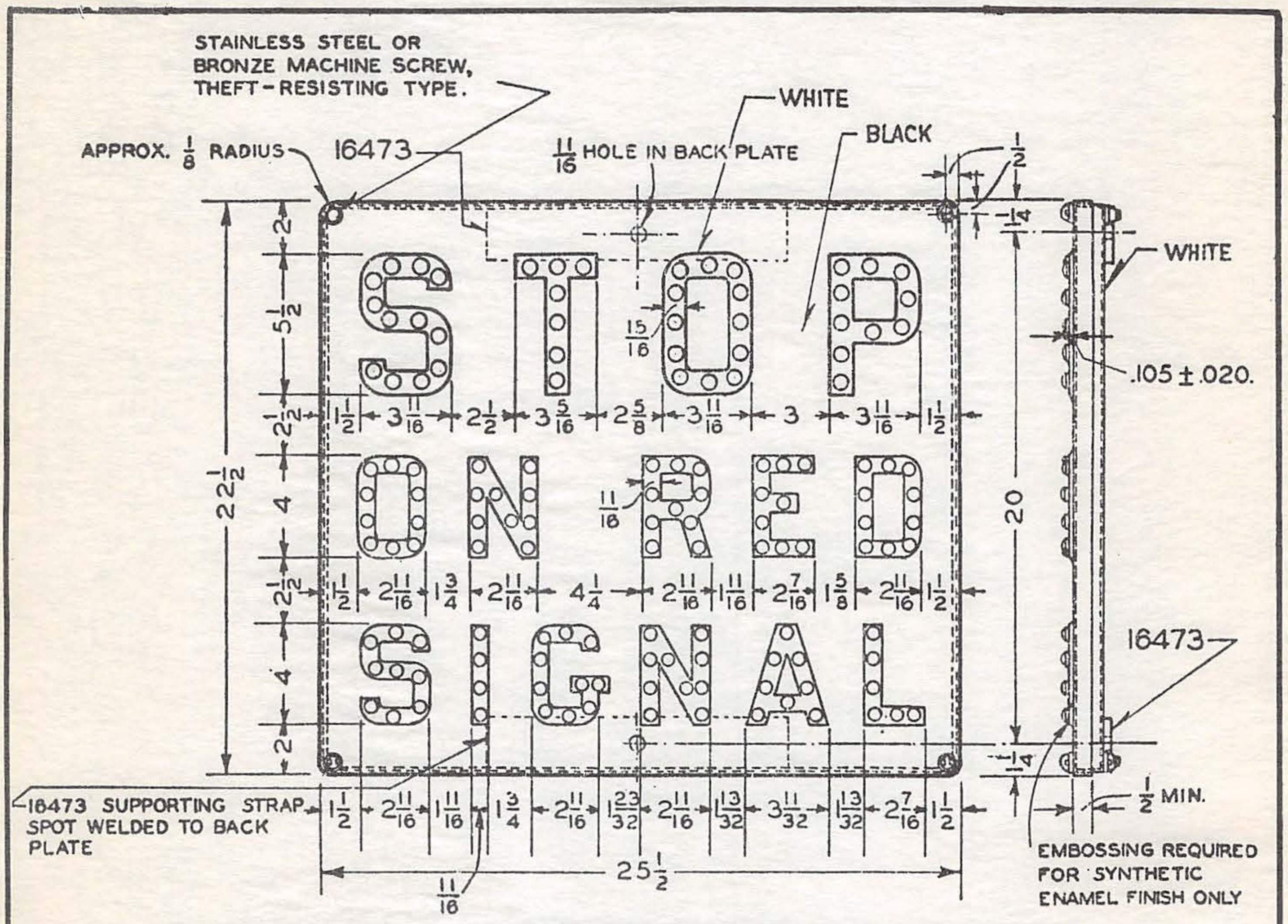
(* ON FACE PLATE ONLY)

S-417

REFLECTOR MULTIPLE TRACK SIGN

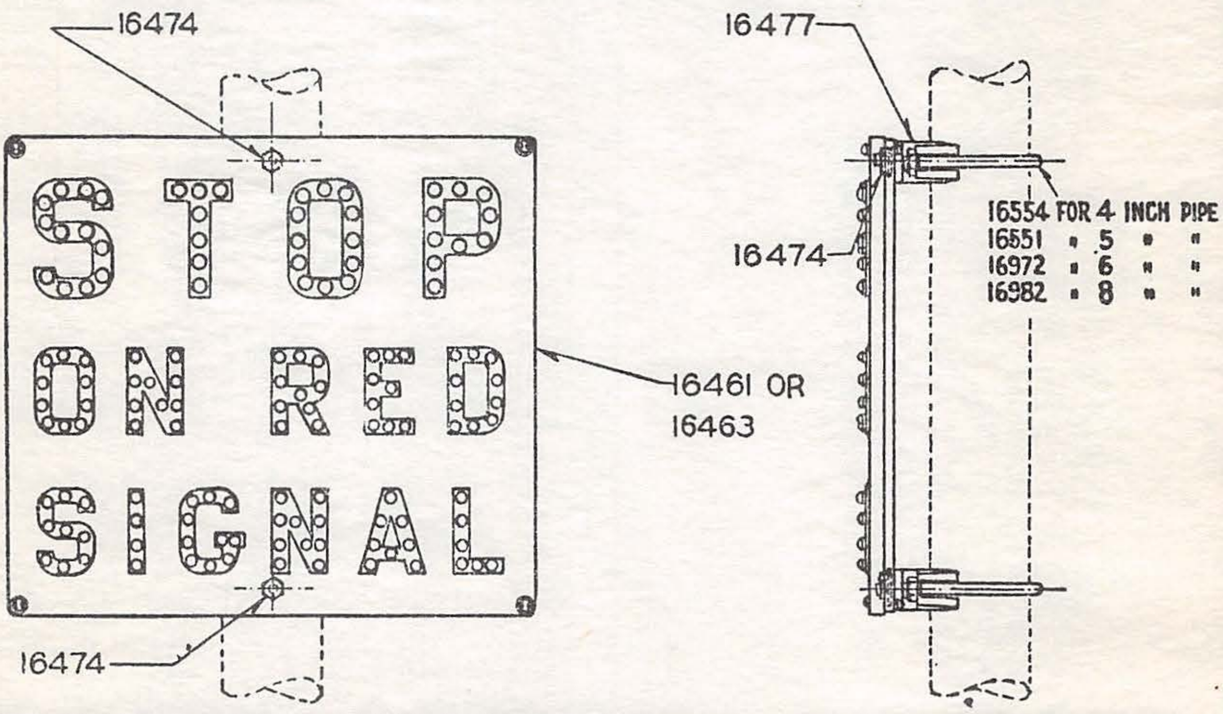
AAR
SIG. SEC.
1645C

						M-1947	SEP. 1947	M-1937	MAR 1937	M-1933	MAY 1933

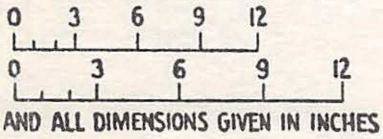

STAINLESS STEEL OR BRONZE MACHINE SCREW, THEFT-RESISTING TYPE.
APPROX. 1/8 RADIUS
16473
11/16 HOLE IN BACK PLATE
WHITE
BLACK
1/2
1/4
WHITE
.105 ± .020.
STOP
ON RED
SIGNAL
15/16
11/16
2
5 1/2
2 1/2
4
2 1/2
4
2
22 1/2
20
1 1/2 · 3 11/16 · 2 1/2 · 3 5/16 · 2 5/8 · 3 11/16 · 3 · 3 11/16 · 1 1/2
1 1/2 · 2 11/16 · 1 3/4 · 2 11/16 · 4 1/4 · 2 11/16 · 1 11/16 · 2 7/16 · 1 5/8 · 2 11/16 · 1 1/2
1 1/2 · 2 11/16 · 1 11/16 · 1 3/4 · 2 11/16 · 1 23/32 · 2 11/16 · 1 13/32 · 3 11/32 · 1 13/32 · 2 7/16 · 1 1/2
16473
1/4
1/2 MIN.
16473 SUPPORTING STRAP SPOT WELDED TO BACK PLATE
25 1/2
11/16
EMBOSSING REQUIRED FOR SYNTHETIC ENAMEL FINISH ONLY

16461 STOP ON RED SIGNAL SIGN ONLY SYNTHETIC ENAMEL FINISH.
16463 " " " " " " VITREOUS " " (ON FACE PLATE ONLY)

NOTE: NUMBER AND SPACING OF REFLECTOR UNITS SHALL BE AS SHOWN.


16474
STOP
ON RED
SIGNAL
16474
16461 OR 16463
16477
16474
16554 FOR 4 INCH PIPE
16551 " 5 " "
16972 " 6 " "
16982 " 8 " "

16467 STOP ON RED SIGNAL SIGN COMPLETE, SYNTHETIC ENAMEL FINISH, FOR (SPECIFY PIPE SIZE)
16468 " " " " " " VITREOUS " " " " " "


0 3 6 9 12
0 3 6 9 12

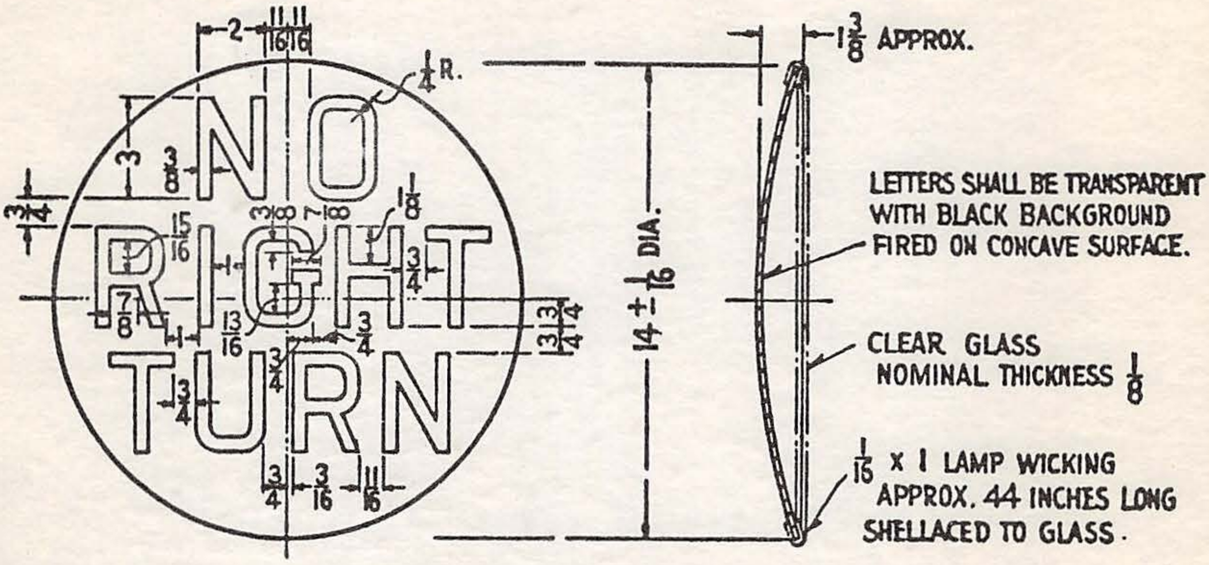
SCALES AND ALL DIMENSIONS GIVEN IN INCHES

S-418

REFLECTOR STOP ON RED SIGNAL SIGN

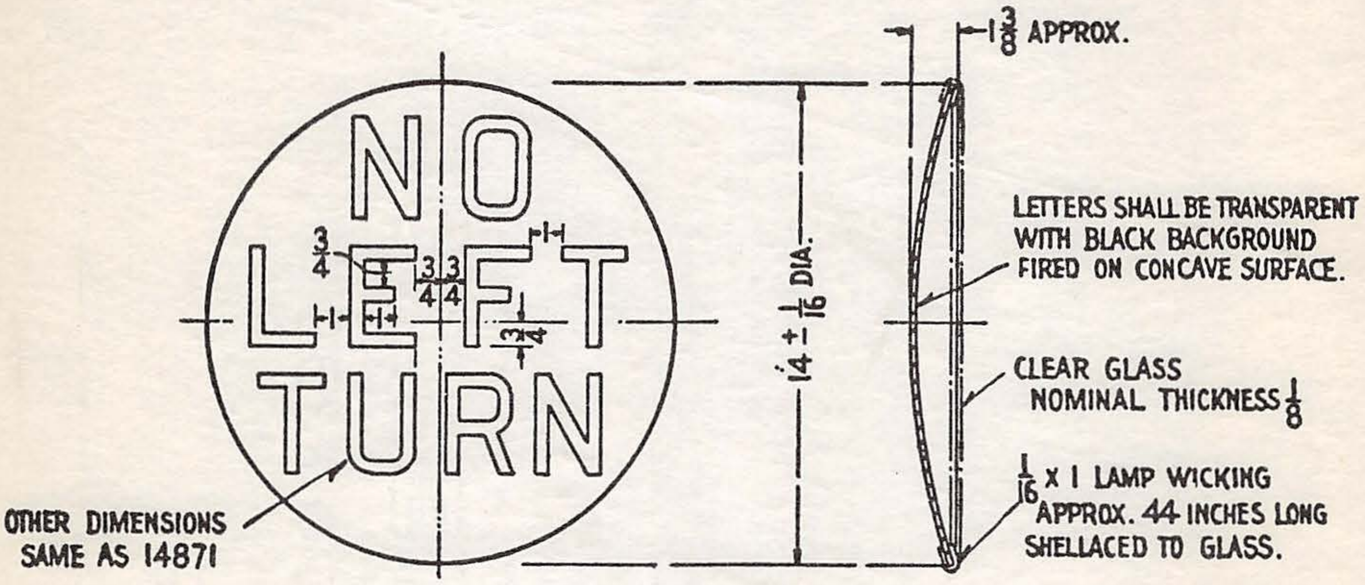
AAR
SIG. SEC.
1646C

					M-1947	SEP. 1947	M-1937	MAR 1937	M-1933	MAY 1933



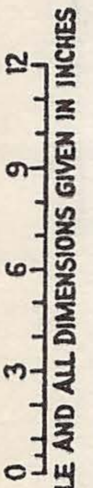
2
11/16
11/16
1/4 R.
3
3/8
3/4
15/16
1 1/8
3/4
7/8
13/16
3/4
3/4
3 3/4
3/4
3/16
11/16
14 ± 1/16 DIA.
1 3/8 APPROX.
LETTERS SHALL BE TRANSPARENT WITH BLACK BACKGROUND FIRED ON CONCAVE SURFACE.
CLEAR GLASS NOMINAL THICKNESS 1/8
1/16 x 1 LAMP WICKING APPROX. 44 INCHES LONG SHELLACED TO GLASS.

14871 SIGN ROUNDEL "NO RIGHT TURN" COMPL. WITH WICKING

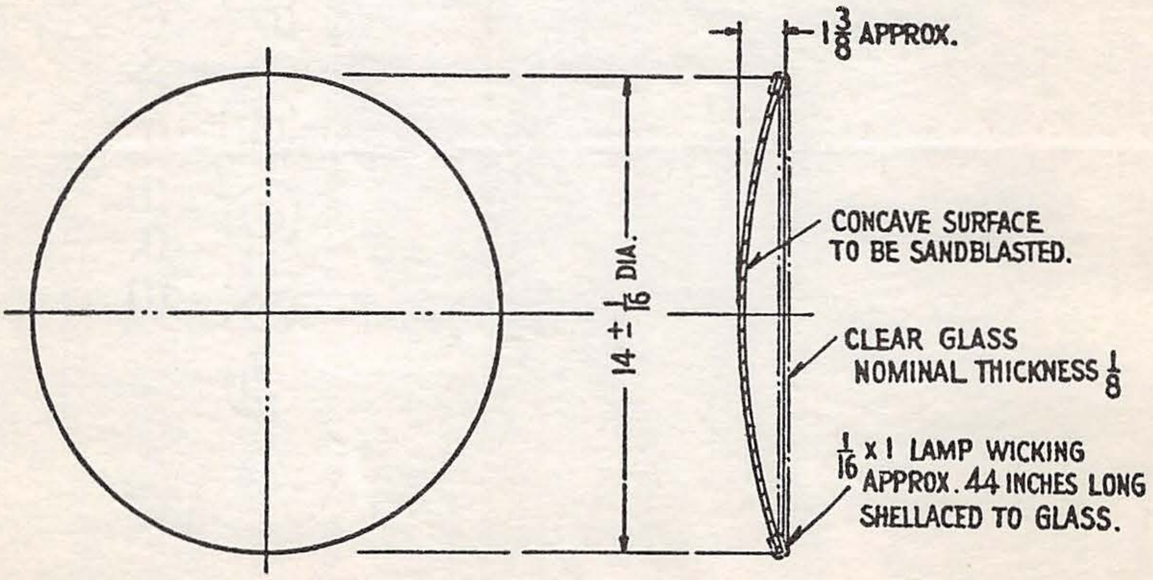


1 3/8 APPROX.
3/4
1
3/4
3/4
1
1
1
3/4
14 ± 1/16 DIA.
LETTERS SHALL BE TRANSPARENT WITH BLACK BACKGROUND FIRED ON CONCAVE SURFACE.
CLEAR GLASS NOMINAL THICKNESS 1/8
1/16 x 1 LAMP WICKING APPROX. 44 INCHES LONG SHELLACED TO GLASS.
OTHER DIMENSIONS SAME AS 14871

14872 SIGN ROUNDEL "NO LEFT TURN" COMPL. WITH WICKING



0
3
6
9
12
SCALE AND ALL DIMENSIONS GIVEN IN INCHES



1 3/8 APPROX.
14 ± 1/16 DIA.
CONCAVE SURFACE TO BE SANDBLASTED.
CLEAR GLASS NOMINAL THICKNESS 1/8
1/16 x 1 LAMP WICKING APPROX. 44 INCHES LONG SHELLACED TO GLASS.

14873 COVER GLASS ROUNDEL COMPL. WITH WICKING

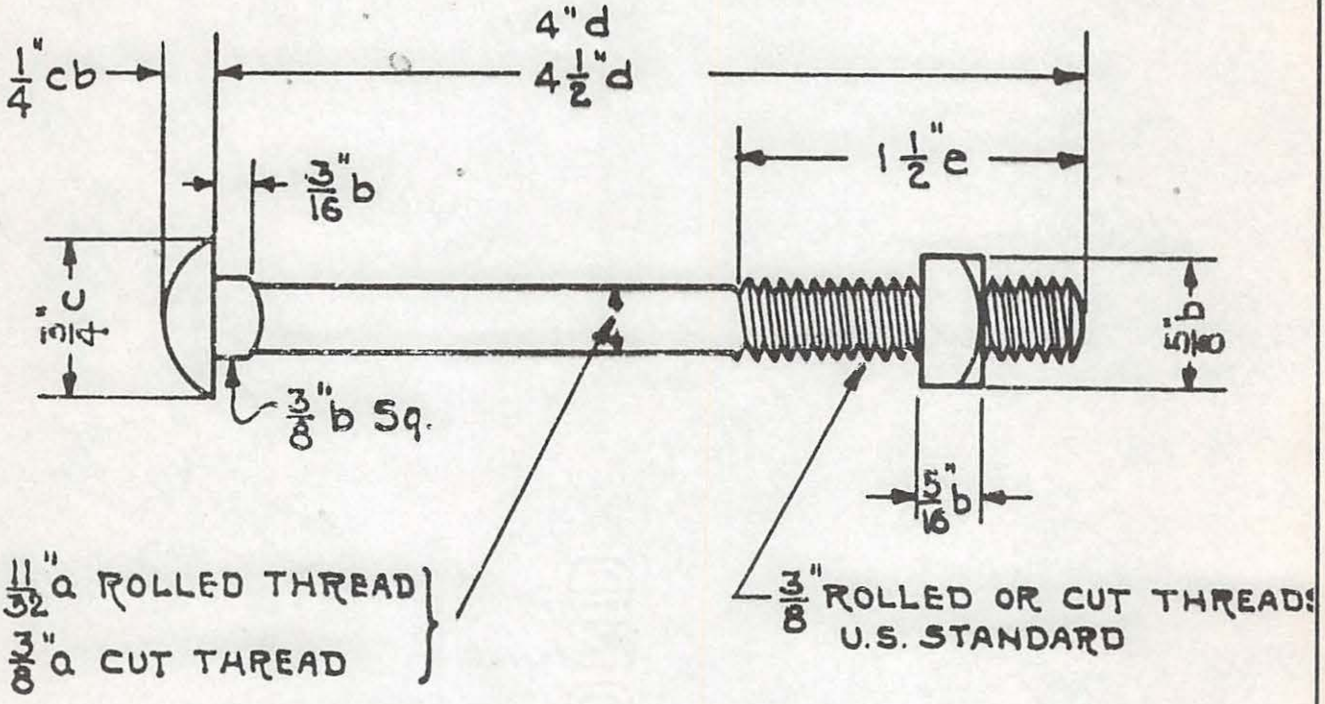
S-459

SIGN AND COVER GLASS ROUNDELS

ILLUMINATED HIGHWAY CROSSING SIGN

M-1948 SEP. 1948

AAR
SIG. SEC.
1487A


4"d
4½"d
¼"cb
3/16"b
1½"e
5/8"c
3/8"b Sq.
5/8"b
5/16"b
11/32"a ROLLED THREAD
3/8"a CUT THREAD
3/8" ROLLED OR CUT THREAD
U.S. STANDARD

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED
ASSEMBLY - BEFORE PACKING NUT TO BE RUN DOWN TO AT LEAST TWO THREADS BEYOND END OF BOLT

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8
e	1/4	1/4
cb	1/16	1/32

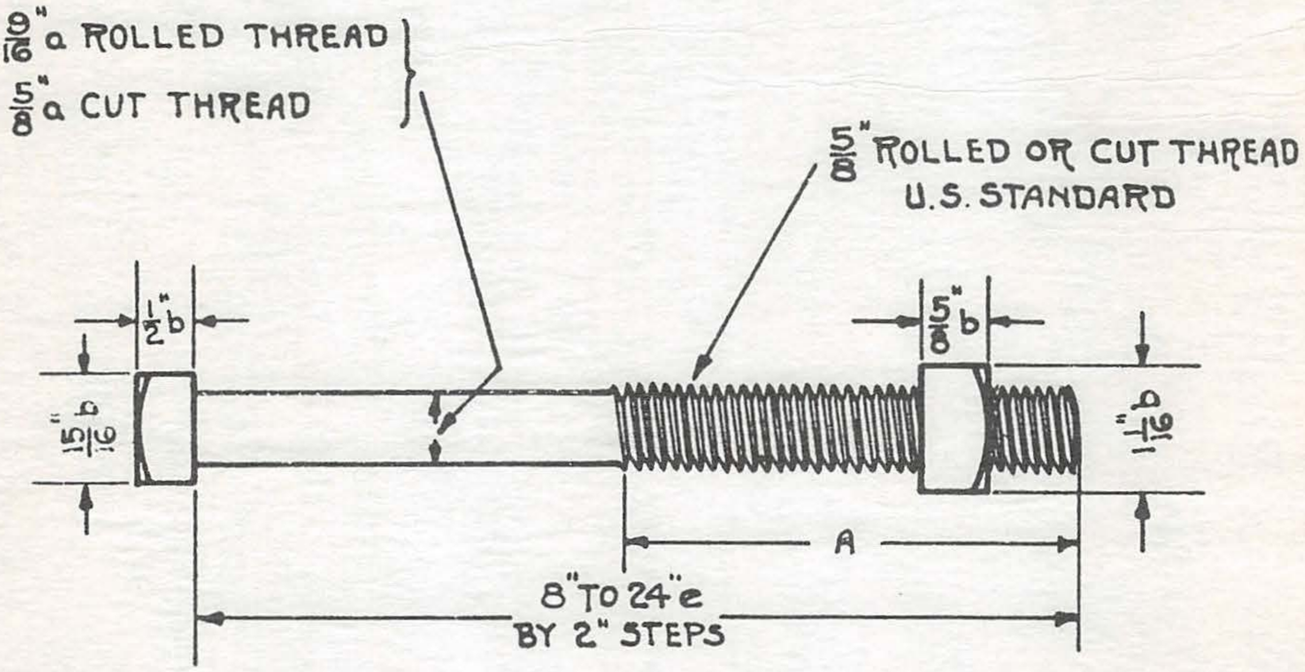
NO SCALE

3/8 INCH CARRIAGE BOLT

T & T
1743

June, 1926

SPECIFICATION DEPT.
DEC
8
1947


9/16" a ROLLED THREAD
5/8" a CUT THREAD
5/8" ROLLED OR CUT THREAD
U.S. STANDARD
1/2" b
15/16" b
5/8" b
1 1/16" b
A
8" TO 24" e
BY 2" STEPS

LENGTH OF BOLT	A
8" TO 12"	4" e
14" TO 24"	6" e

MATERIAL ~ MILD STEEL (GRADE A)
FINISH - GALVANIZED
ASSEMBLY - BEFORE PACKING NUT TO BE RUN DOWN TO AT LEAST TWO THREADS BEYOND END OF BOLT

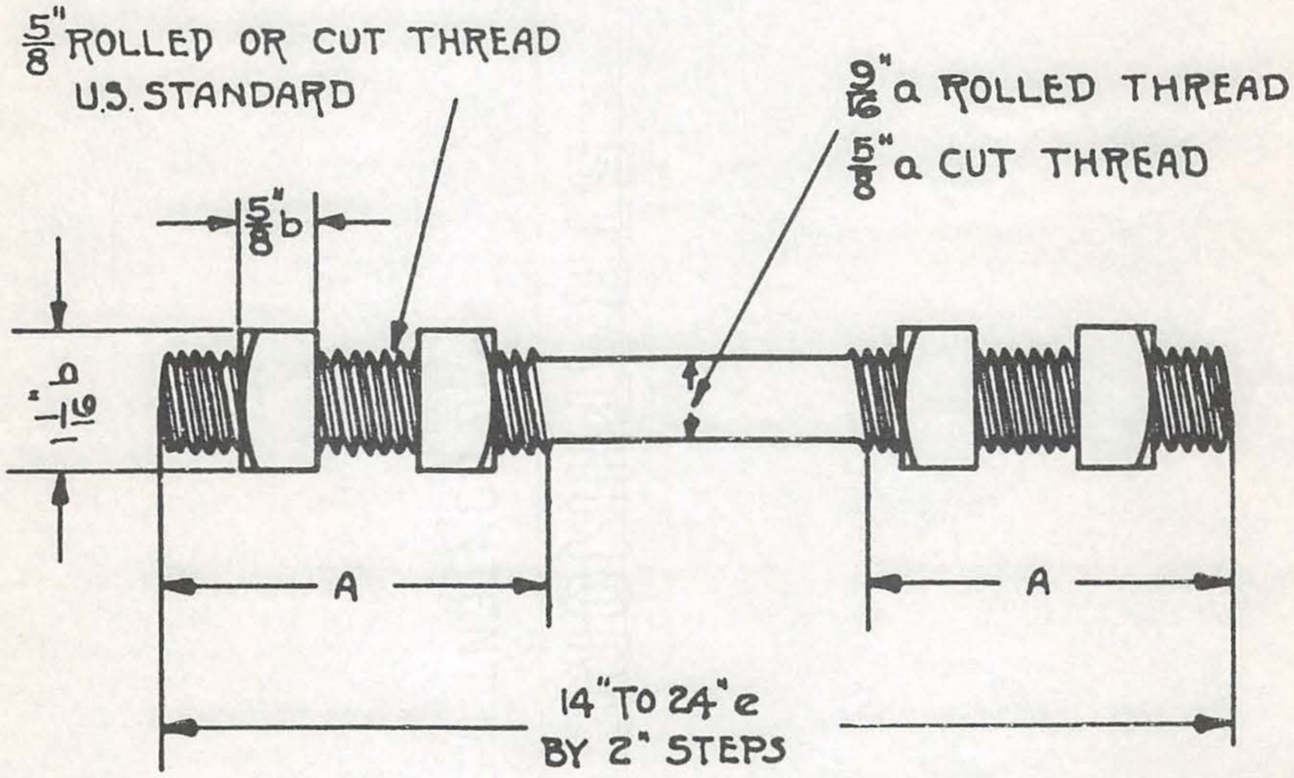
ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
e	1/4	1/4

No Scale

CROSSARM BOLT

T&T 1744

June, 1926


5/8" ROLLED OR CUT THREAD
U.S. STANDARD
9/16" a ROLLED THREAD
5/8" a CUT THREAD
5/8" b
1 1/16" b
A
A
14" TO 24" e
BY 2" STEPS

LENGTH OF BOLT	A
14" & 16"	6" e
18" TO 24"	8" e

MATERIAL – MILD STEEL (GRADE A)
FINISH – GALVANIZED
ASSEMBLY – BEFORE PACKING, NUTS TO BE RUN DOWN TO AT LEAST TWO THREADS BEYOND END OF BOLT

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
e	1/4	1/4

NO SCALE

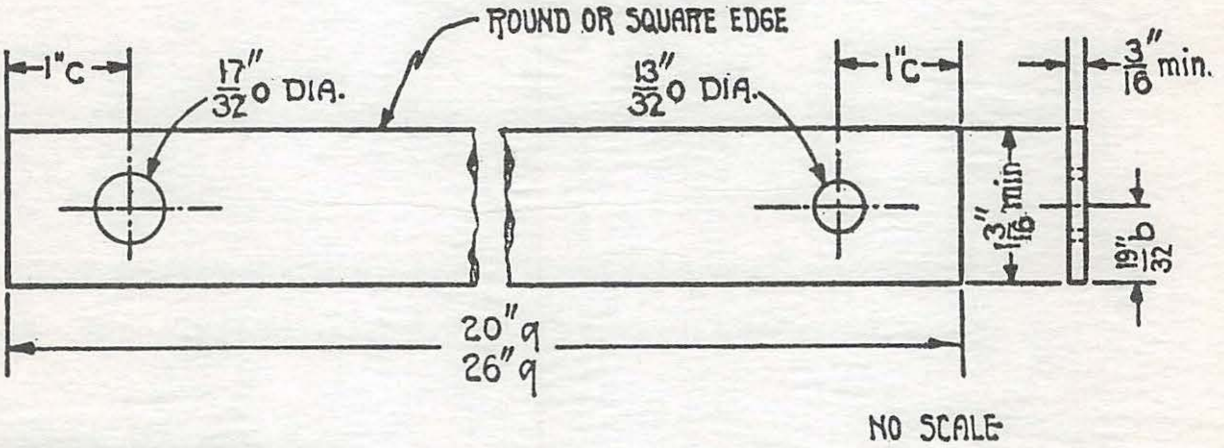
DOUBLE ARMING BOLT

June, 1926

T&T 1745

S-205

REVISED
NOV
10
1947
SPECIFICATION DEPT.



ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
σ	1/16	0
g	1/4	0

MATERIAL-STEEL OF A GRADE SUCH THAT THE FINISHED BRACES WILL CONFORM TO THE MECHANICAL REQUIREMENTS SPECIFIED HEREON.

FINISH-GALVANIZED

MECHANICAL REQUIREMENTS

THE BREAKING WEIGHT AT THE BOLT HOLES SHALL NOT BE LESS THAN SIX THOUSAND FIVE HUNDRED (6,500) POUNDS. THE BREAKING WEIGHT AT ANY POINT BETWEEN THE BOLT HOLES SHALL NOT BE LESS THAN SEVENTEEN THOUSAND FIVE HUNDRED (17,500) POUNDS.

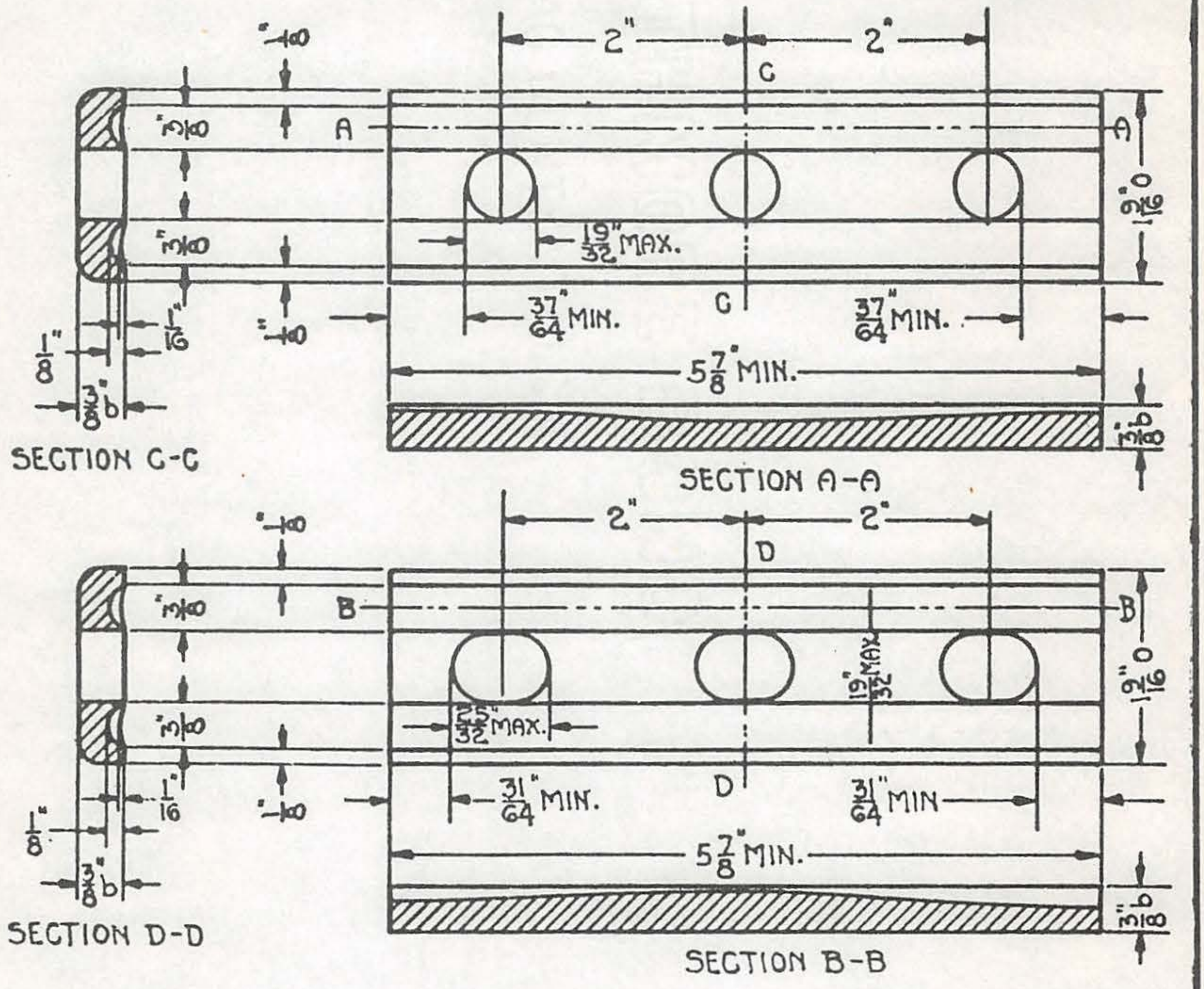
THE BRACE SHALL BE CAPABLE OF BEING BENT ABOUT A LINE THROUGH THE CENTER OF EITHER BOLT HOLE AND AROUND A DIAMETER OF NINE-SIXTEENTHS (9/16) INCH THROUGH AN ANGLE OF NOT LESS THAN TEN (10) DEGREES WITHOUT RUPTURE OF THE STEEL. IN MAKING THIS TEST THE END OF THE BRACE SHALL BE CLAMPED FIRMLY BETWEEN A PLAIN SURFACE AND A METAL PLATE HAVING ONE EDGE SHAPED TO A CYLINDRICAL SURFACE OF THE REQUIRED DIAMETER. THE PLATE SHALL AFFORD A FLAT BEARING SURFACE FOR THE ENTIRE PORTION OF THE BRACE BETWEEN THE CENTER LINE OF THE BOLT HOLE AND THE ADJACENT END. THE ANGLE OF DEFLECTION SHALL BE MEASURED FROM A POINT TWO (2) INCHES DISTANT FROM THE CENTER LINE OF THE HOLE.

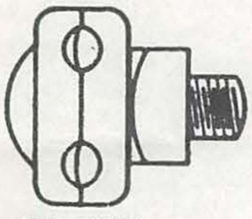
THAT PART OF THE BRACE BETWEEN THE BOLT HOLES SHALL WITHSTAND, WITHOUT RUPTURE OF THE STEEL, THE FOLLOWING TEST. THE BRACE SHALL BE CLAMPED AGAINST A NINE-SIXTEENTH (9/16) INCH ROUND MANDREL AND BENT AROUND THE MANDREL WITHOUT THE USE OF TOOLS. THE BRACE SHALL THEN BE COMPRESSED IN A VISE AND BE CLOSED UPON ITSELF TO WITHIN ONE AND ONE-QUARTER (1¼) INCHES, AS MEASURED ON THE CHORD ONE INCH FROM THE POINT OF GREATEST CURVATURE.

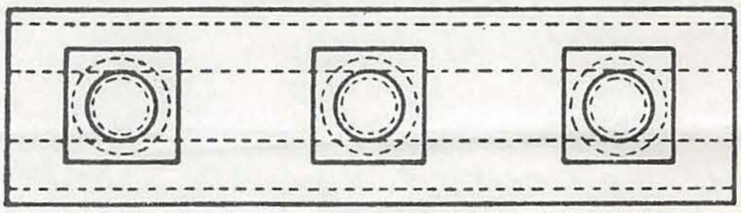
FLAT CROSS BRACES

June, 1937 | **June, 1926**

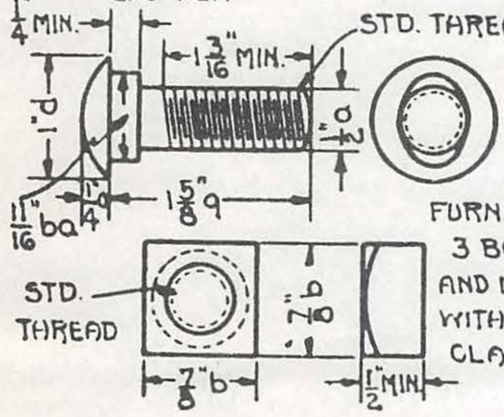
T&T 1747


SECTION C-C
SECTION A-A
SECTION D-D
SECTION B-B
2"
2"
C
D
A
B
19/32" MAX.
25/32" MAX.
37/64" MIN.
31/64" MIN.
5 7/8" MIN.
1 9/16" O
3/16" b
3/8" b
1/8"
1/16"
19/32" MAX.


END VIEW


ASSEMBLY

THE CLAMP SHALL BE CAPABLE OF BEING ASSEMBLED WITH BOLTS OF THE REQUIRED SIZE WITHOUT FORCING


1/4" MIN.
STD. THREAD
1 3/16" MIN.
1" d
5/8" a
1 5/8" q
11/16" ba
1/4" o
STD. THREAD
7/8" b
7/8" b
1/2" MIN.

FURNISH 3 BOLTS AND NUTS WITH EACH CLAMP

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
d	1/8	1/8
o	1/16	0
q	1/4	0
ba	1/32	1/64

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED
ASSEMBLY - PARTS TO BE ASSEMBLED AS SHOWN BEFORE SHIPMENT.

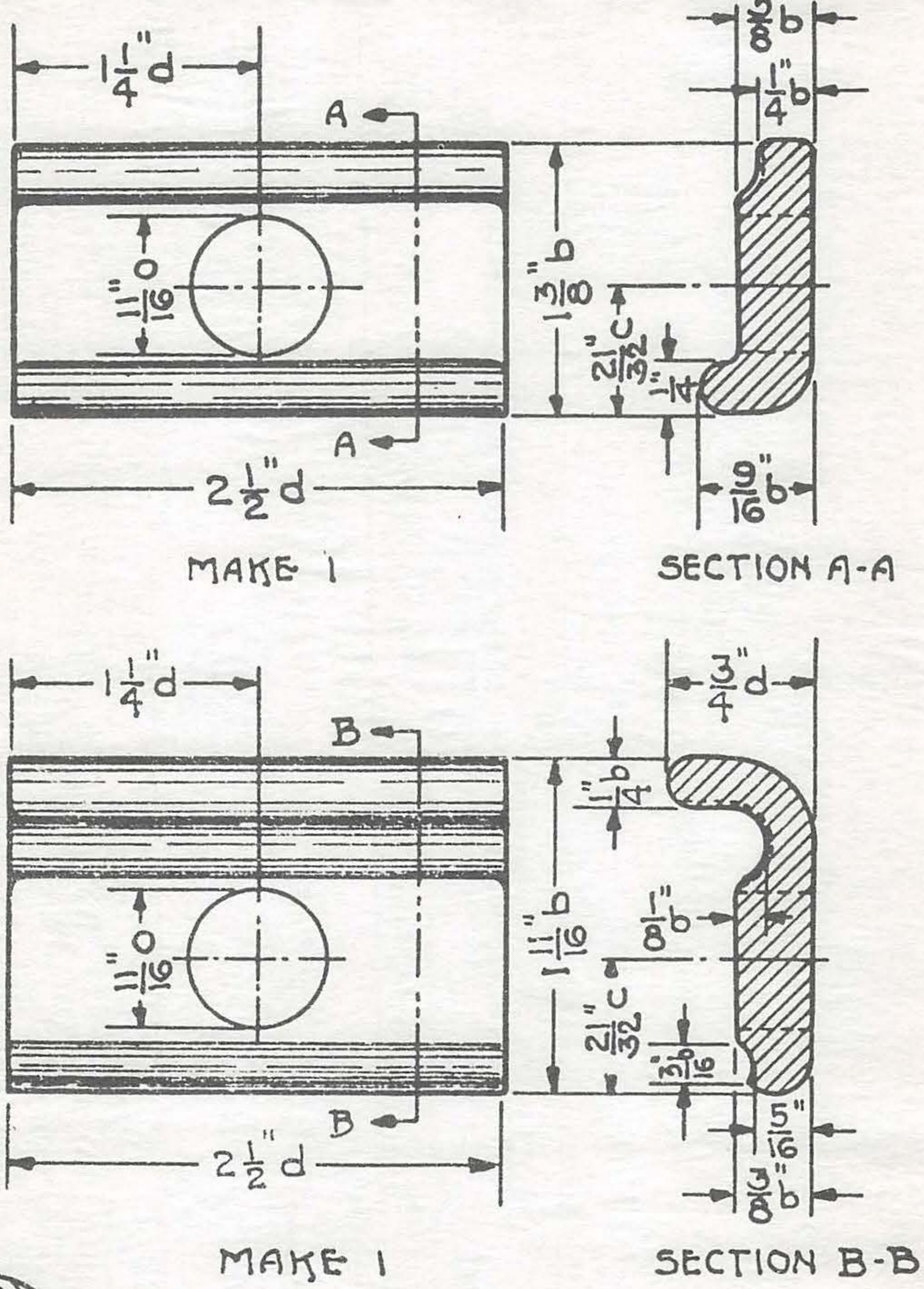
NO SCALE

THREE BOLT GUY CLAMP

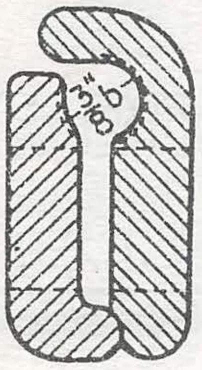
June, 1926

T&T
1753

S-504


1 1/4" d
A
A
11/16" o
1 3/8" b
21/32" c
1/4"
3/8" b
1/4" b
9/16" b
2 1/2" d
MAKE 1
SECTION A-A
1 1/4" d
B
B
11/16" o
1 11/16" b
1/4" b
3/4" d
1/8" b
21/32" c
3/16"
5/16"
3/8" b
2 1/2" d
MAKE 1
SECTION B-B

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED



ASSEMBLY

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8
o	1/16	0

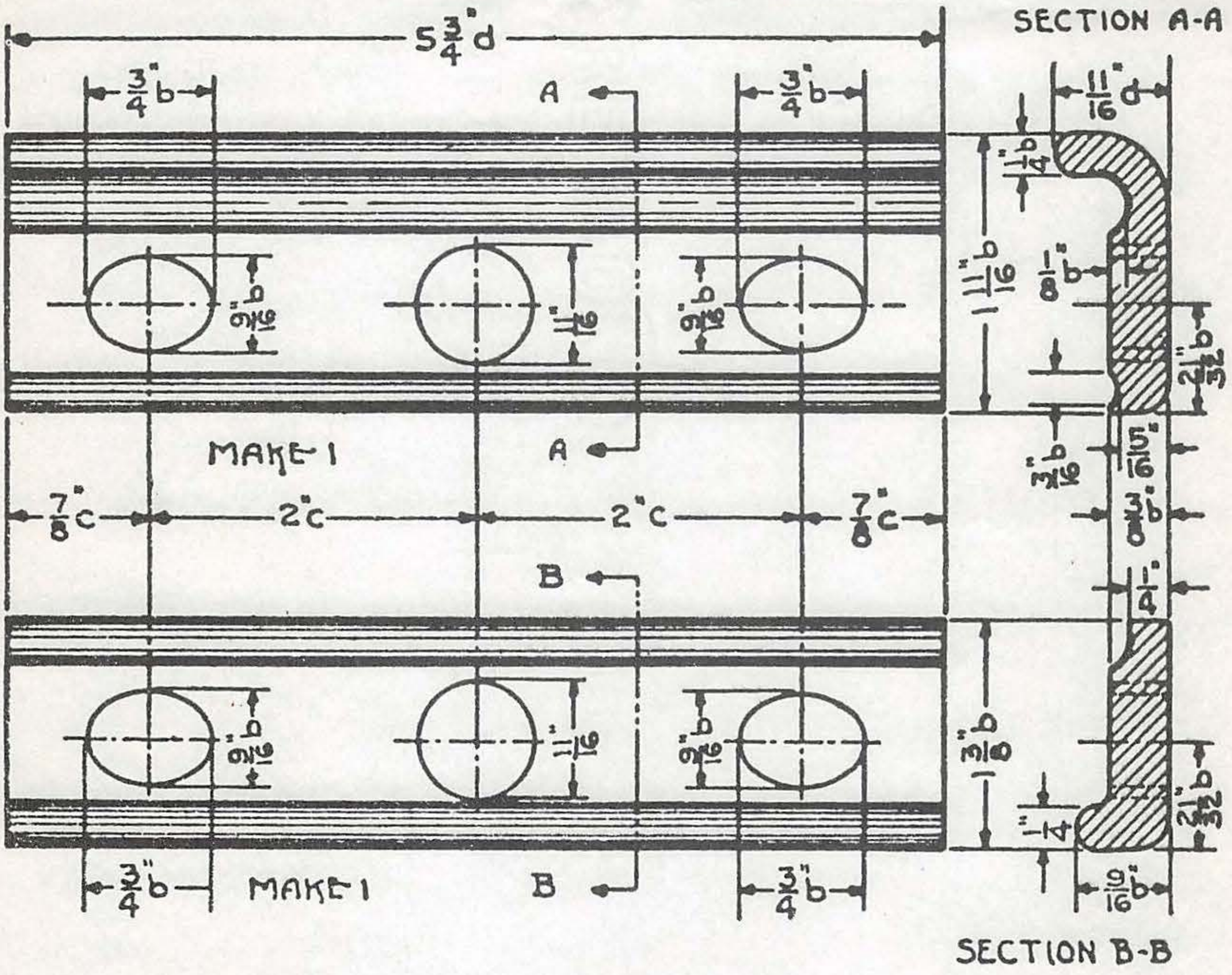
No Scale

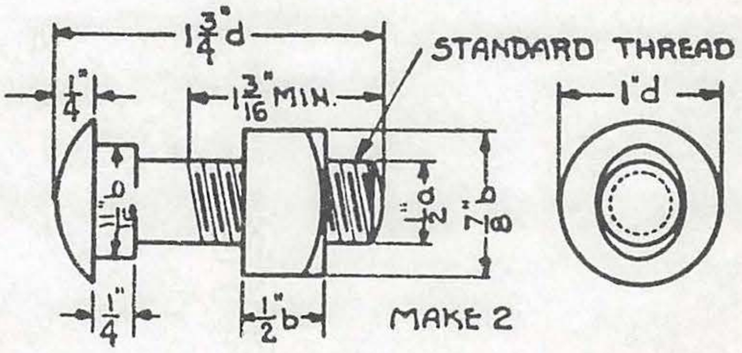
ONE BOLT MESSENGER CLAMP

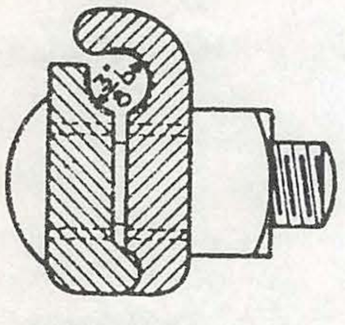
T&T 1754

June, 1926

S-505


5¾" d
¾" b
A
¾" b
SECTION A-A
11/16" d
¼" b
1 11/16" b
⅛" b
9/16" b
11/16"
21/32" b
MAKE 1
A
3/16" b
5/16"
3/16" b
⅞" c
2" c
2" c
⅞" c
B
¼"
1 3/16" b
9/16" b
11/16"
9/16" b
21/32" b
¼"
¾" b
MAKE 1
B
¾" b
9/16" b
SECTION B-B


1¾" d
STANDARD THREAD
¼"
1 3/16" MIN.
1" d
11/16" b
½" a
⅞" b
¼"
½" b
MAKE 2



ASSEMBLY

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8

MATERIAL-MILD STEEL GRADE A
FINISH-GALVANIZED
ASSEMBLY-PARTS TO BE
ASSEMBLED AS SHOWN
BEFORE SHIPMENT

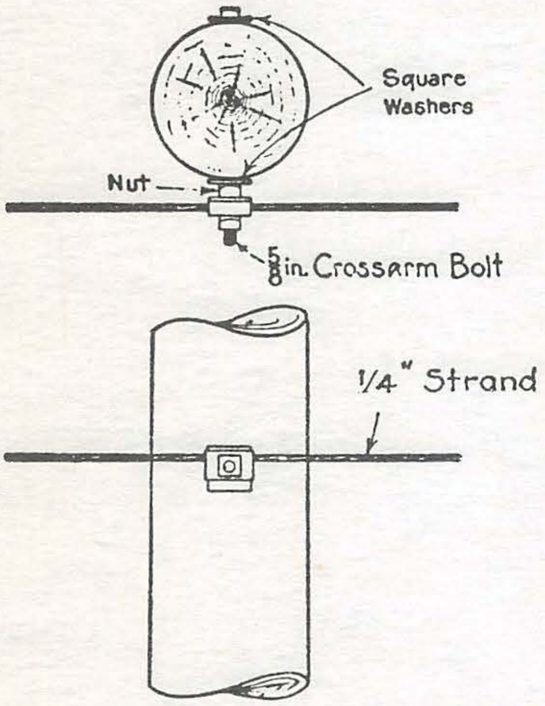
No Scale

THREE BOLT MESSENGER CLAMP

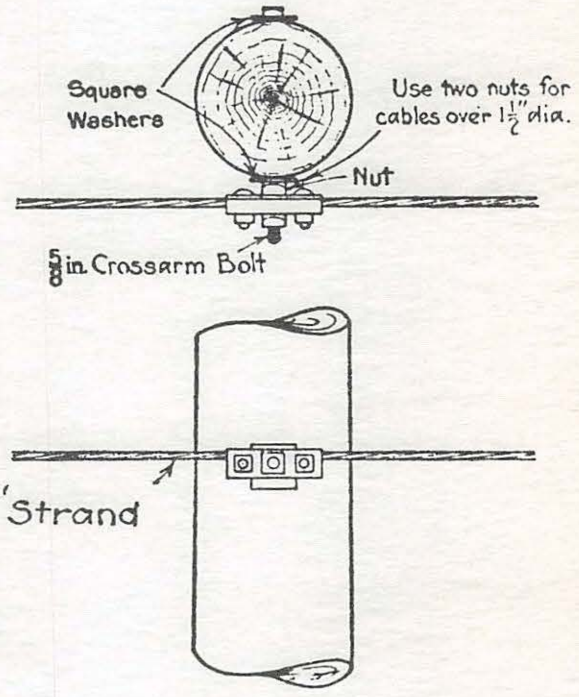
T&T
1755

June, 1926

S-506


Square Washers
Nut
$\frac{5}{8}$in. Crossarm Bolt
1/4" Strand

SINGLE BOLT CLAMP - 1/4"

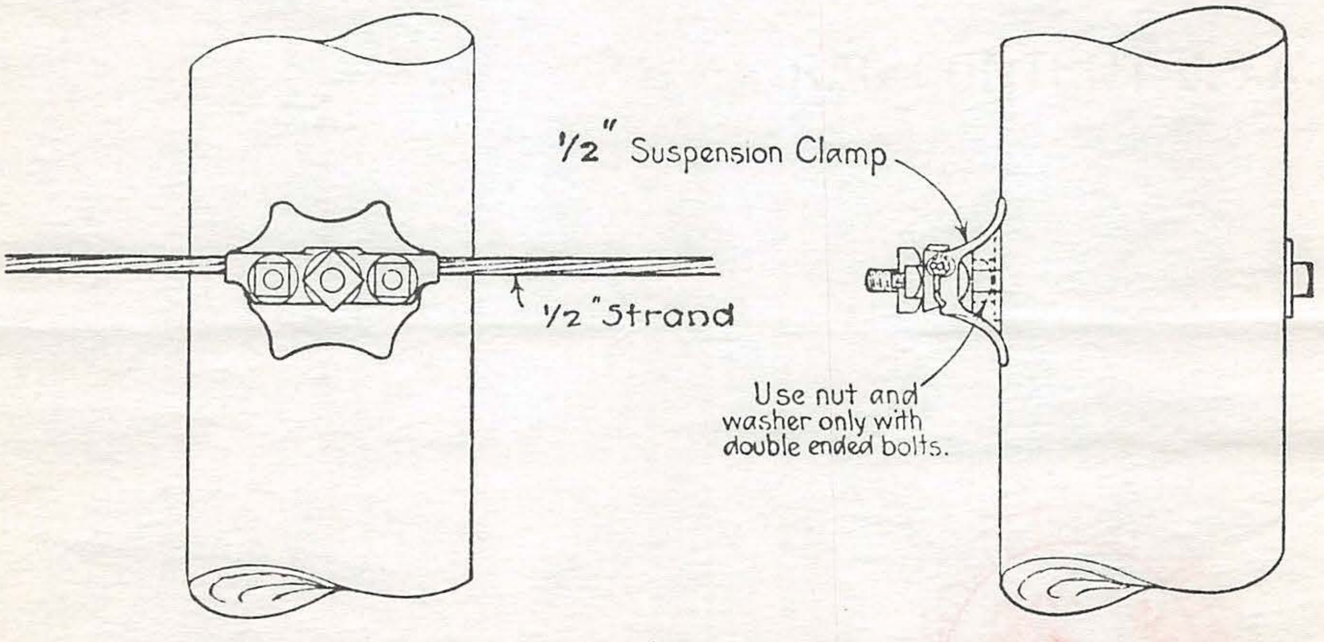

Square Washers
Use two nuts for cables over $1\frac{1}{2}$" dia.
Nut
$\frac{5}{8}$in. Crossarm Bolt
3/8" Strand

THREE BOLT CLAMP - 3/8"

Method of Attaching 1/4" and 3/8" Suspension Strand to Poles

T & T 2680

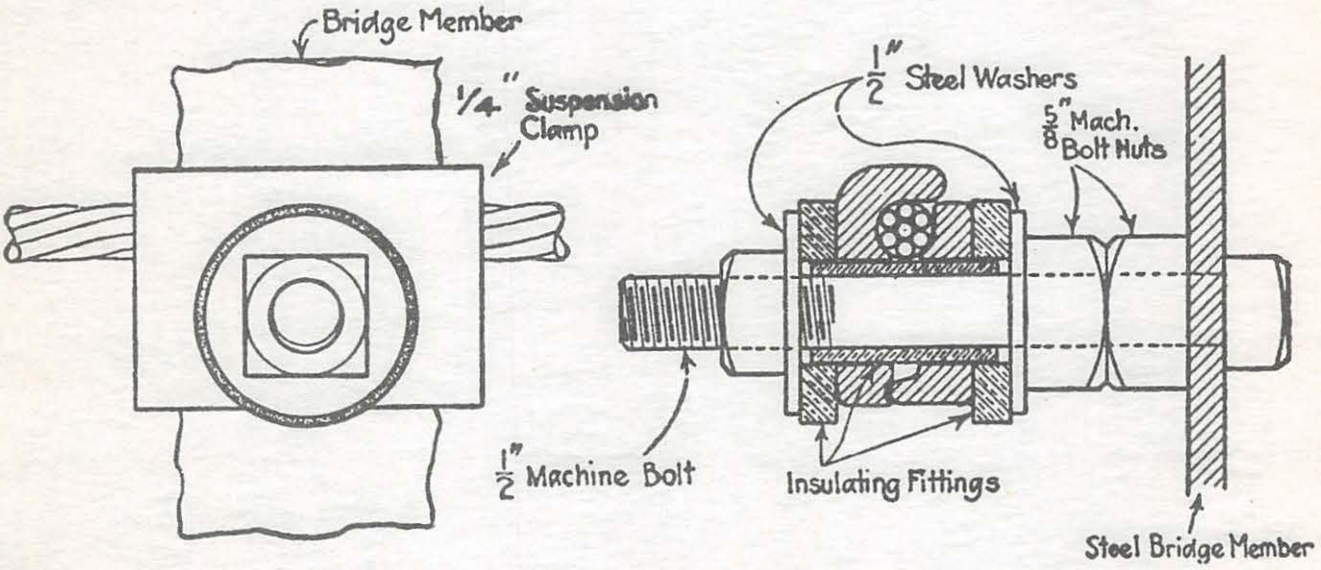
January, 1939


1/2" Suspension Clamp
1/2" Strand
Use nut and washer only with double ended bolts.

Method of Attaching 1/2" Suspension Strand to Poles

T & T 2681

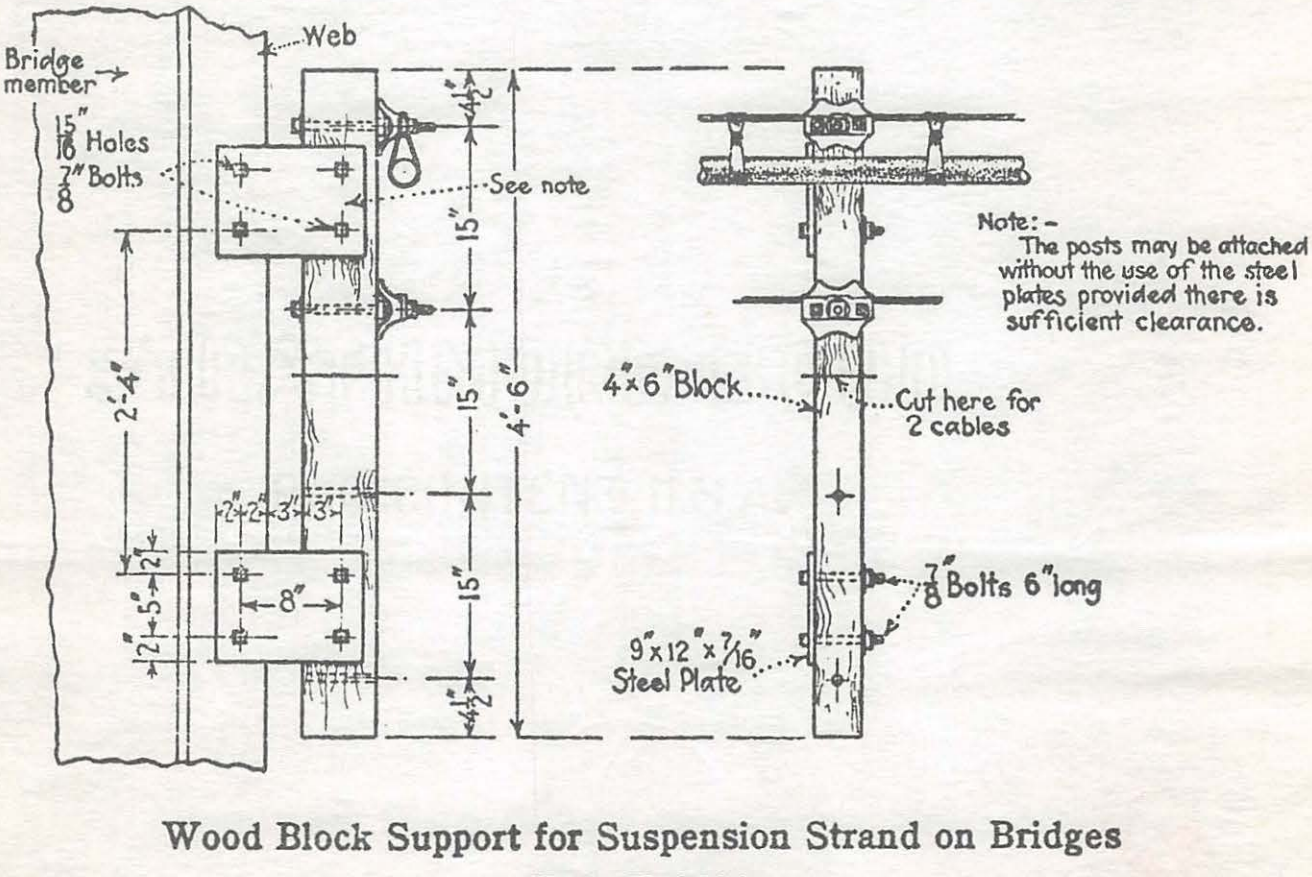
January, 1939


Bridge Member
1/4" Suspension Clamp
1/2" Steel Washers
5/8" Mach. Bolt Nuts
1/2" Machine Bolt
Insulating Fittings
Steel Bridge Member

Insulating Clamp for Attaching Suspension Strand to Bridges

T & T 2685

January, 1939

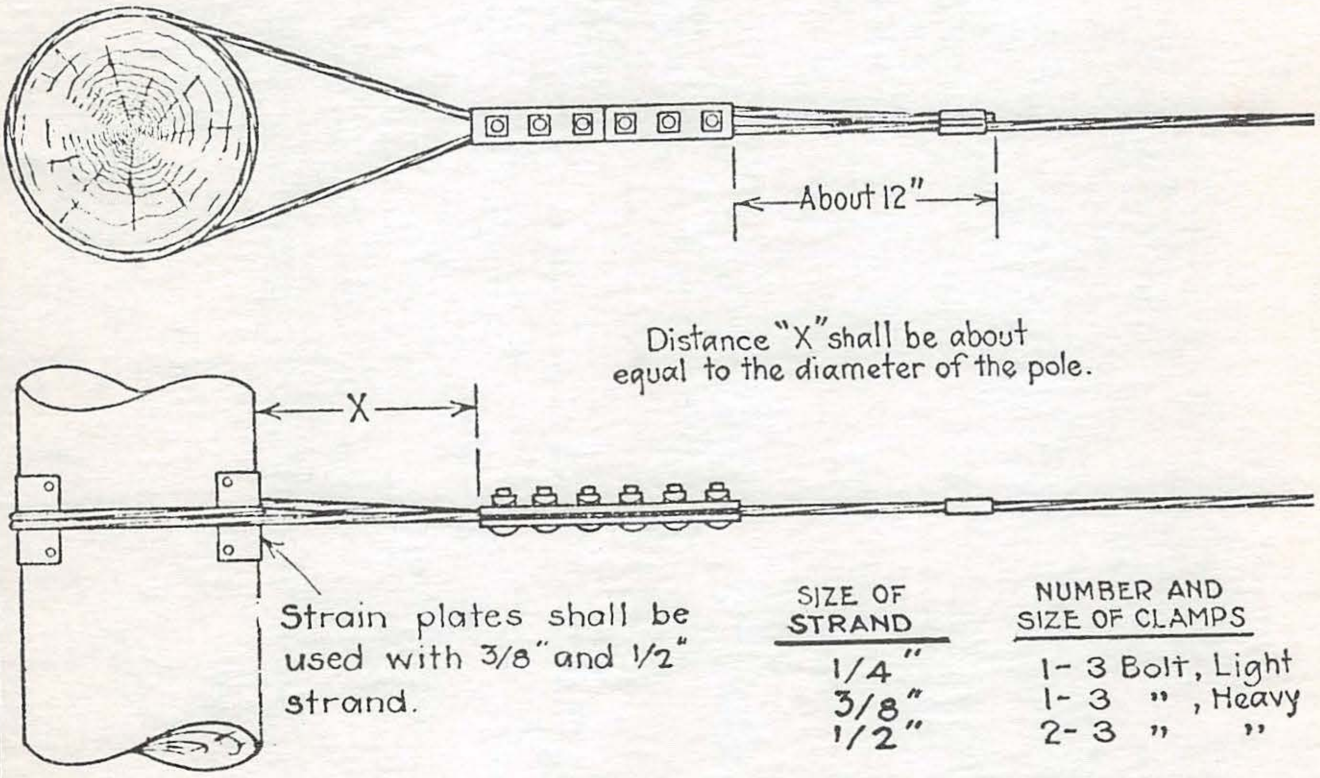

Bridge member
Web
15/16" Holes
7/8" Bolts
See note
4½"
15"
15"
15"
4½"
4'-6"
2'-4"
2"
5"
2"
2"
2"
3"
3"
8"
4"x6" Block
Cut here for 2 cables
7/8" Bolts 6" long
9"x12"x7/16" Steel Plate

Note:-
The posts may be attached without the use of the steel plates provided there is sufficient clearance.

Wood Block Support for Suspension Strand on Bridges

T & T 2686

January, 1939



Distance "X" shall be about equal to the diameter of the pole.

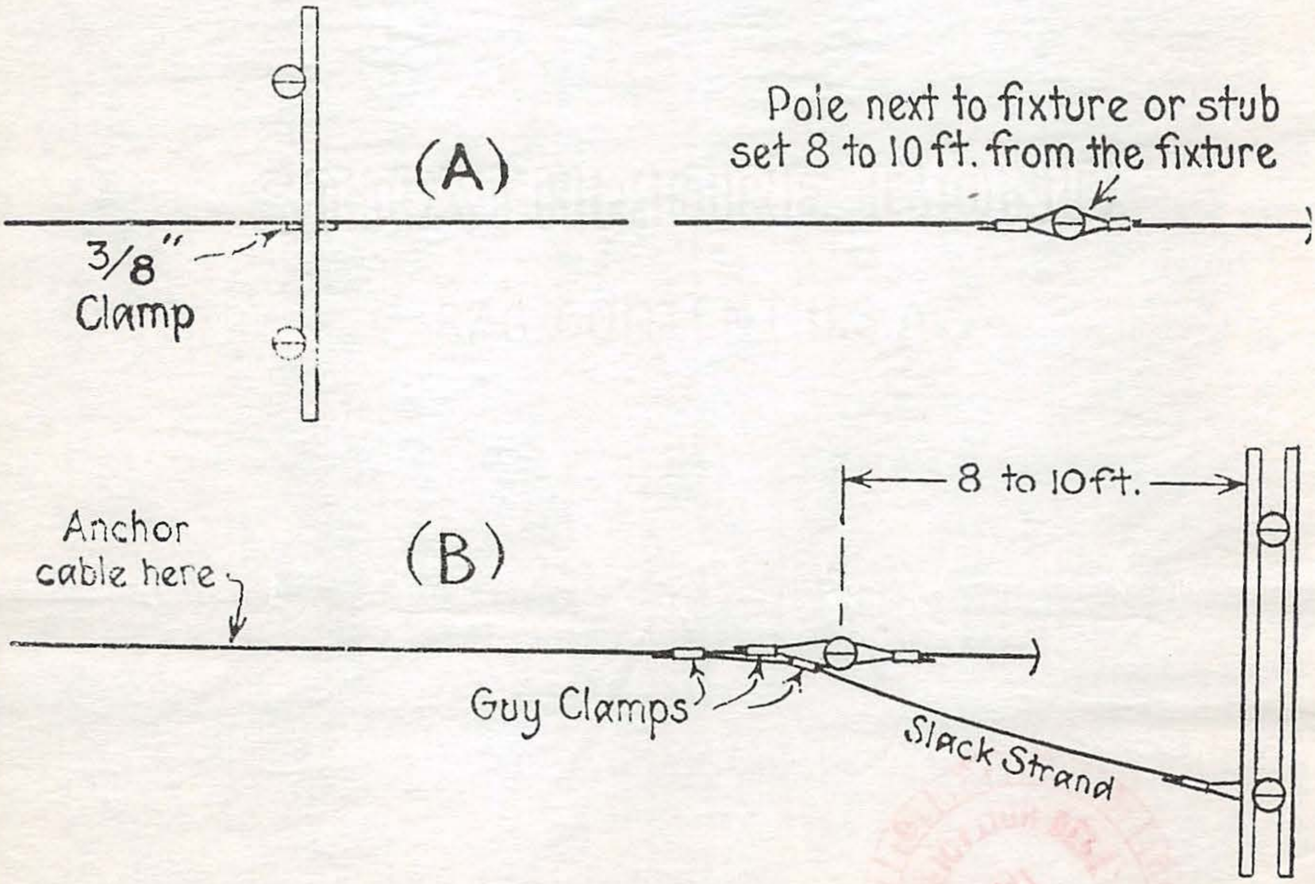
Strain plates shall be used with 3/8" and 1/2" strand.

SIZE OF STRAND	NUMBER AND SIZE OF CLAMPS
1/4"	1- 3 Bolt, Light
3/8"	1- 3 " , Heavy
1/2"	2- 3 " "

Method of Dead-ending Suspension Strand on Poles

T & T 2688

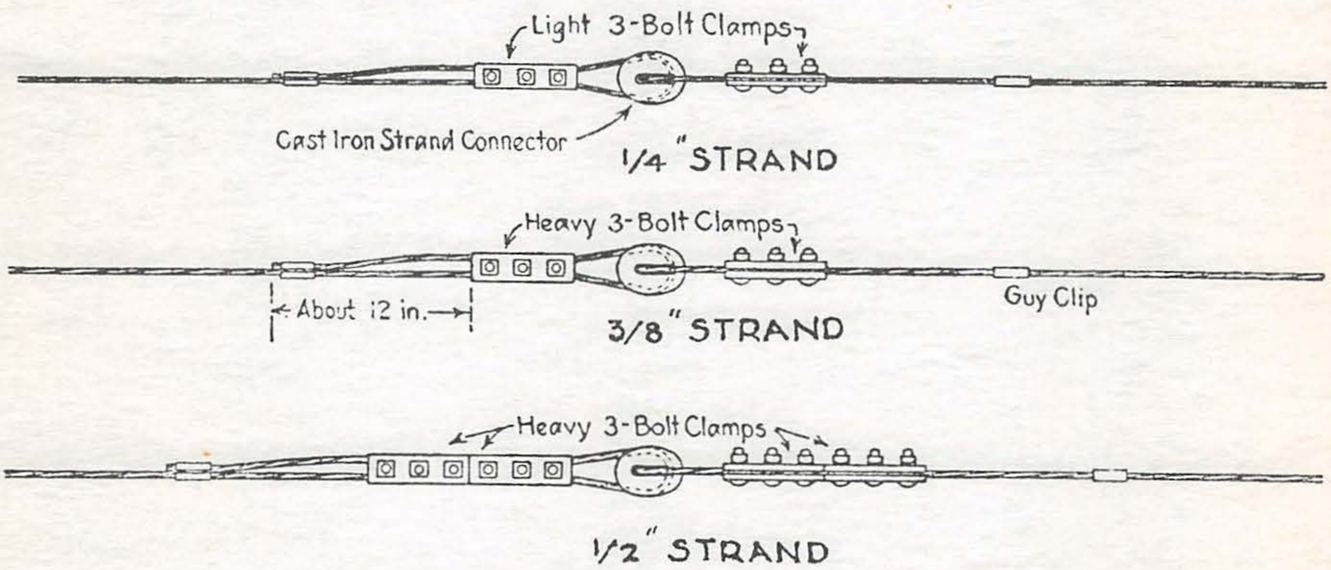
January, 1939


(A)
3/8" Clamp
Pole next to fixture or stub set 8 to 10 ft. from the fixture
(B)
Anchor cable here
8 to 10ft.
Guy Clamps
Slack Strand

Methods of Terminating Suspension Strand at "H" Fixture Terminals

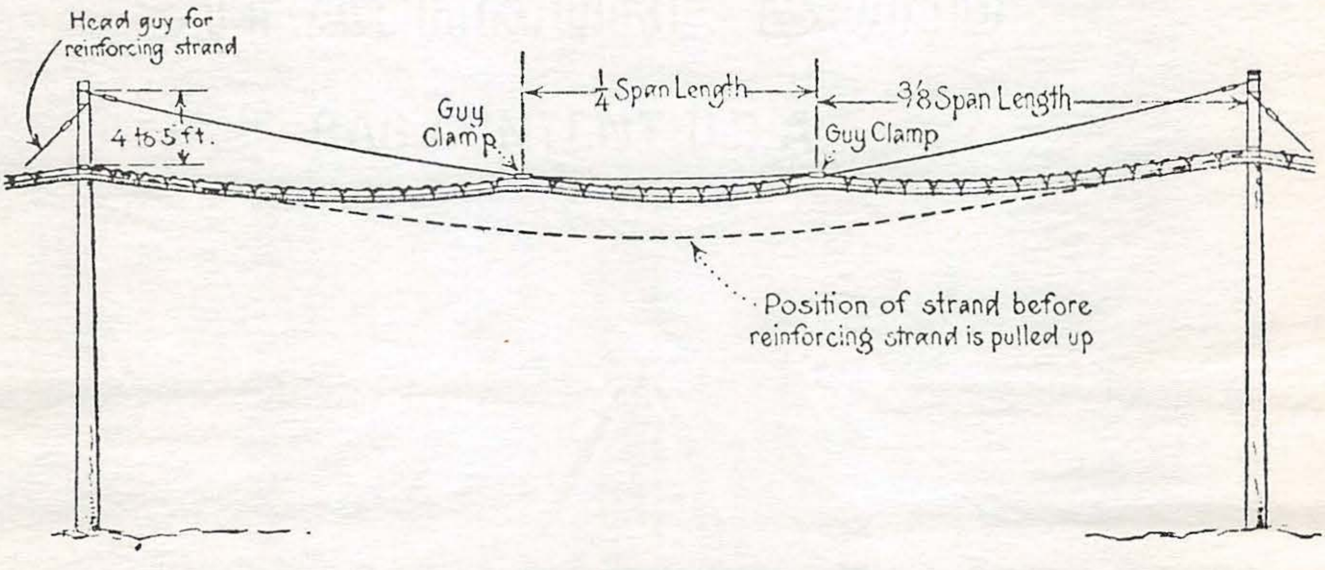
T & T 2689

January, 1939


Light 3-Bolt Clamps
Cast Iron Strand Connector
1/4" STRAND
Heavy 3-Bolt Clamps
About 12 in.
Guy Clip
3/8" STRAND
Heavy 3-Bolt Clamps
1/2" STRAND

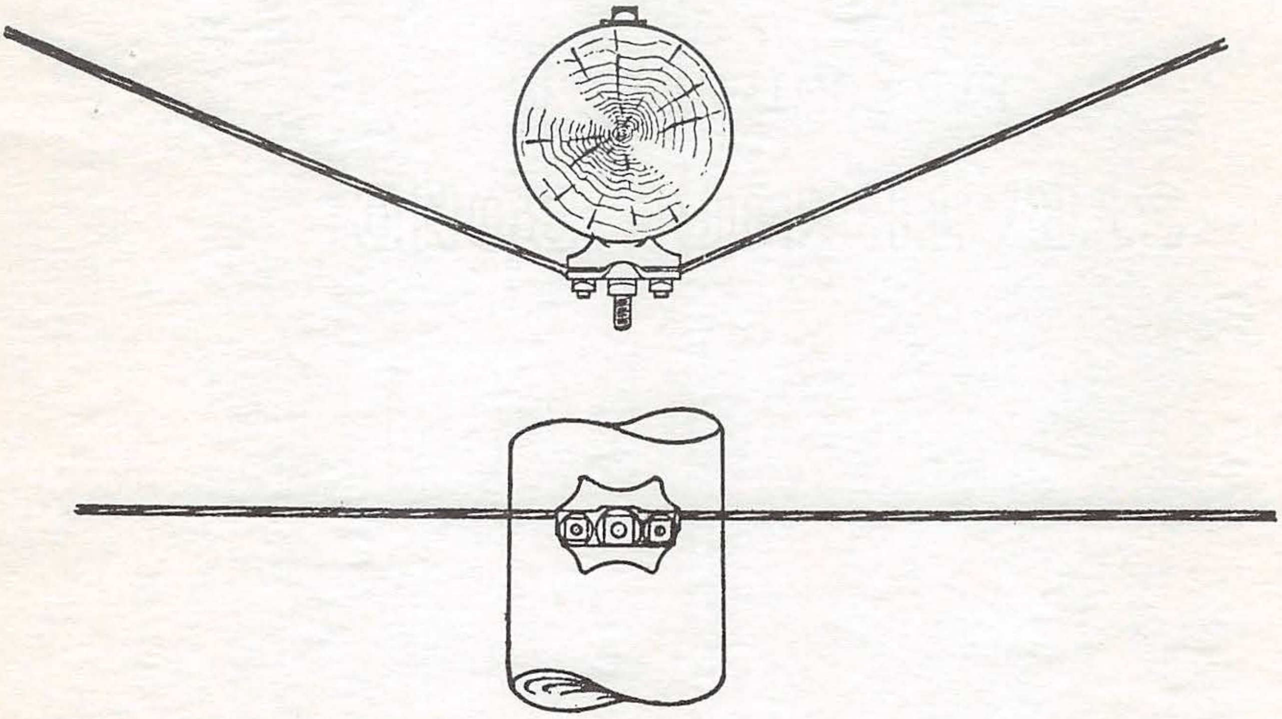
Method of Splicing Suspension Strand
T & T 2690
January, 1939

Reinforcing Suspension Strand. Where an aerial cable is to be installed in a span which exceeds the normal span length by more than fifty per cent and is over 150 feet in length, a reinforcing strand of the same size as the main strand should normally be installed to provide additional support for the main strand, as shown in Drawing T & T 2691.

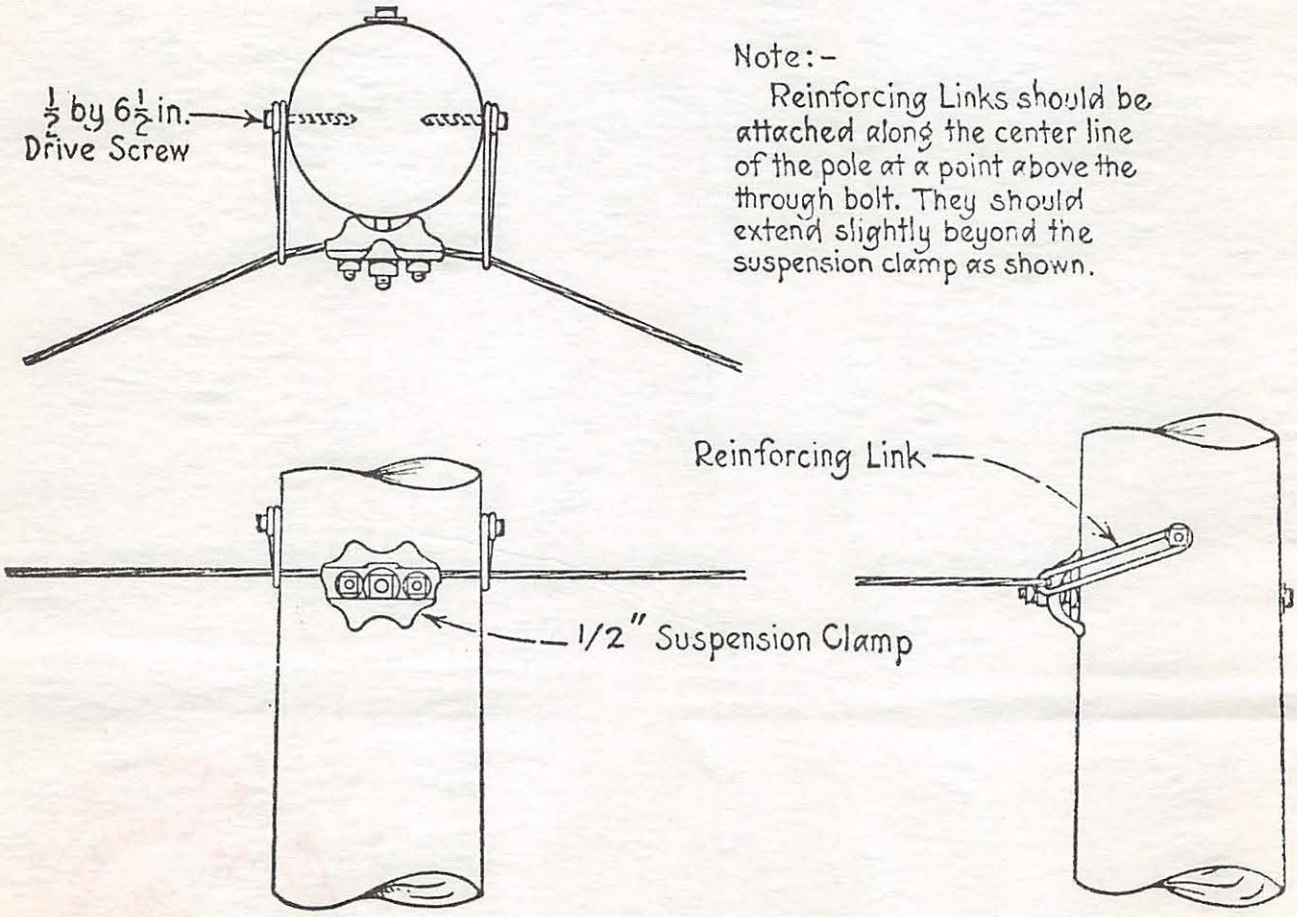

Head guy for reinforcing strand
4 to 5 ft.
Guy Clamp
1/4 Span Length
3/8 Span Length
Guy Clamp
Position of strand before reinforcing strand is pulled up

Reinforcing Suspension Strand for Spans of over Normal Length
T & T 2691
January, 1939

RECEIVED
NOV
10
1947
SPECIFICATION DEPT.



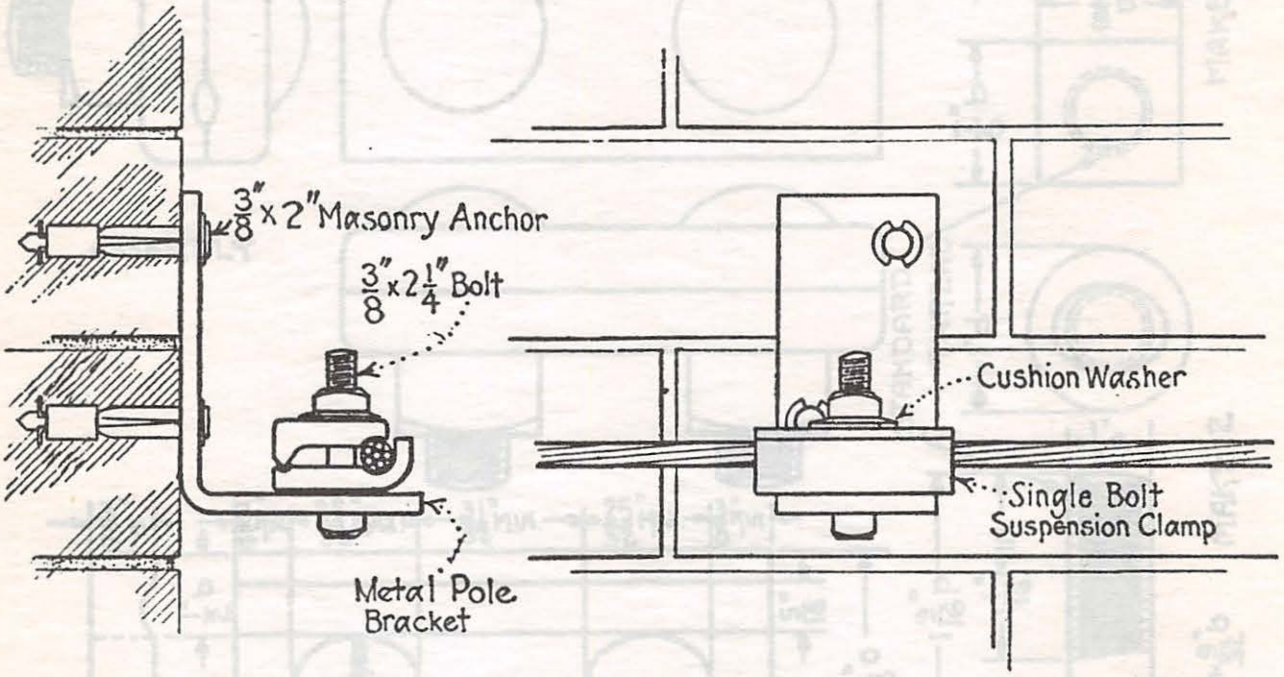
Use of 1/2" Suspension Clamps at Outside Corners
T & T 2682
January, 1939


$\frac{1}{2}$ by $6\frac{1}{2}$ in.
Drive Screw
Reinforcing Link
1/2" Suspension Clamp

Note:-
Reinforcing Links should be attached along the center line of the pole at a point above the through bolt. They should extend slightly beyond the suspension clamp as shown.

Use of Reinforcing Links at Inside Corners
T & T 2683
January, 1939

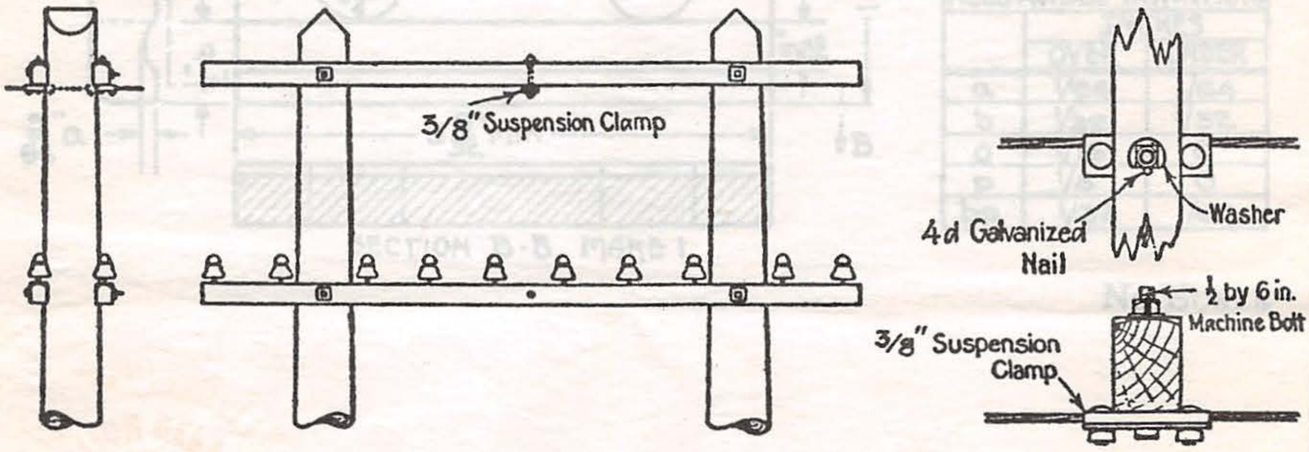
SPECIFICATION DEPT.
DEC 8 1947


$\frac{3}{8}$"×2" Masonry Anchor
$\frac{3}{8}$"×2$\frac{1}{4}$" Bolt
Cushion Washer
Single Bolt Suspension Clamp
Metal Pole Bracket

Use of Wall Bracket for Supporting Suspension Strand on Walls

T & T 2687

January, 1939

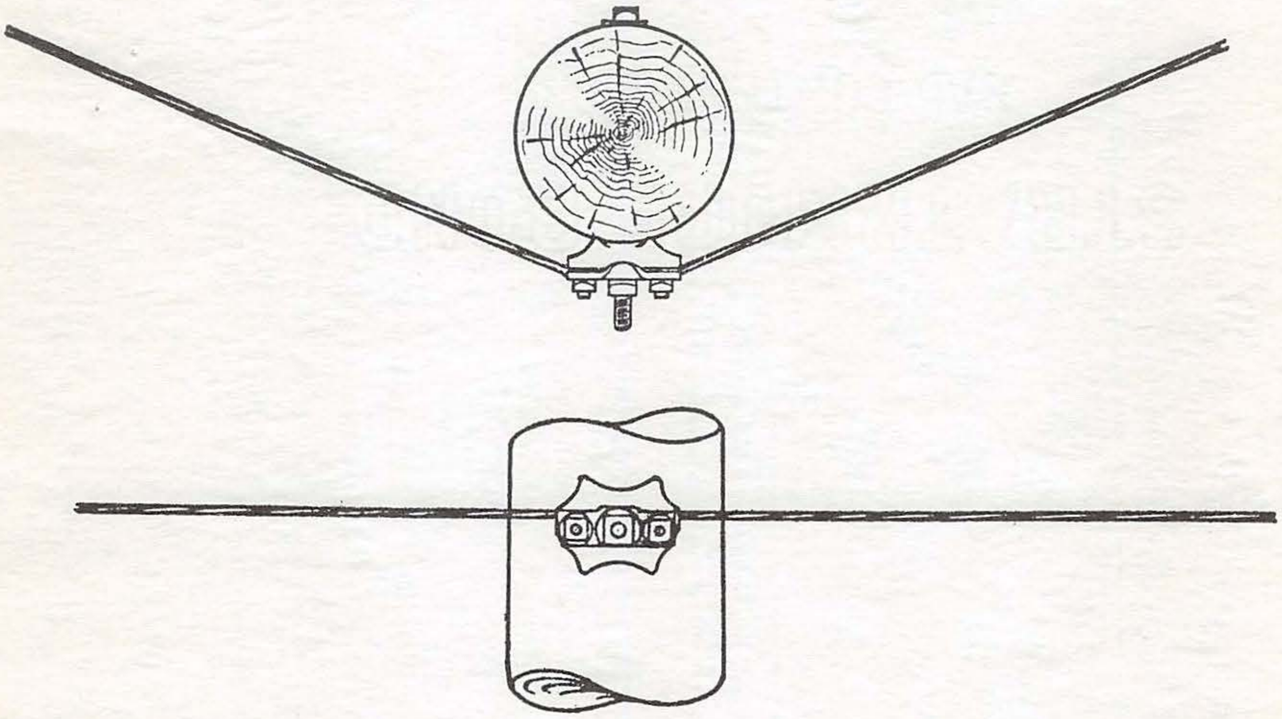

3/8" Suspension Clamp
4d Galvanized Nail
Washer
½ by 6 in. Machine Bolt
3/8" Suspension Clamp

Method of Attaching Suspension Strand to "H" Fixtures

T & T 2684

January, 1939

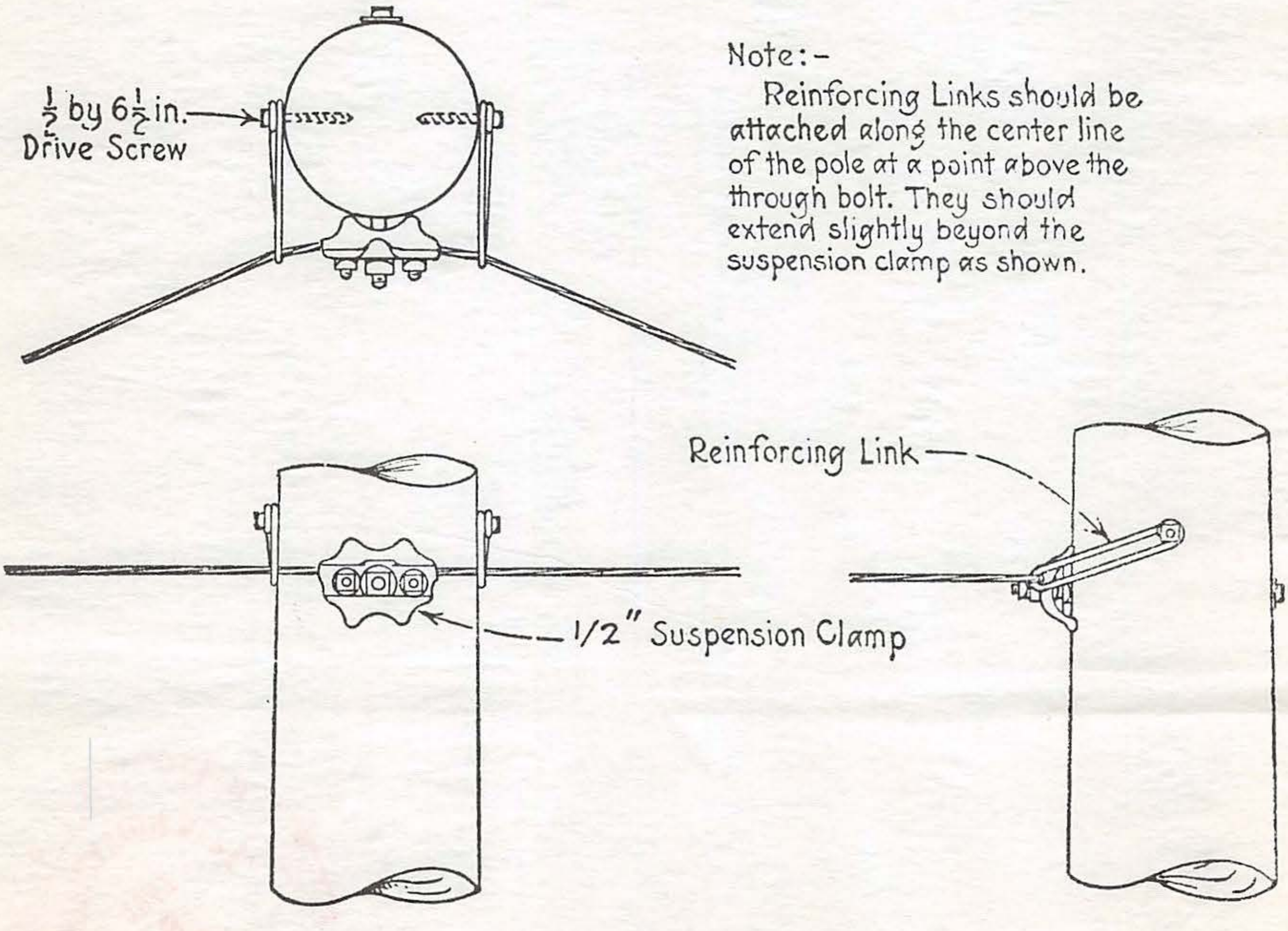
SPECIFICATION D'PT.
DEC
8
1947



Use of 1/2 ″Suspension Clamps at Outside Corners

T & T 2682

January, 1939



½ by 6½ in. Drive Screw
Reinforcing Link
1/2″ Suspension Clamp

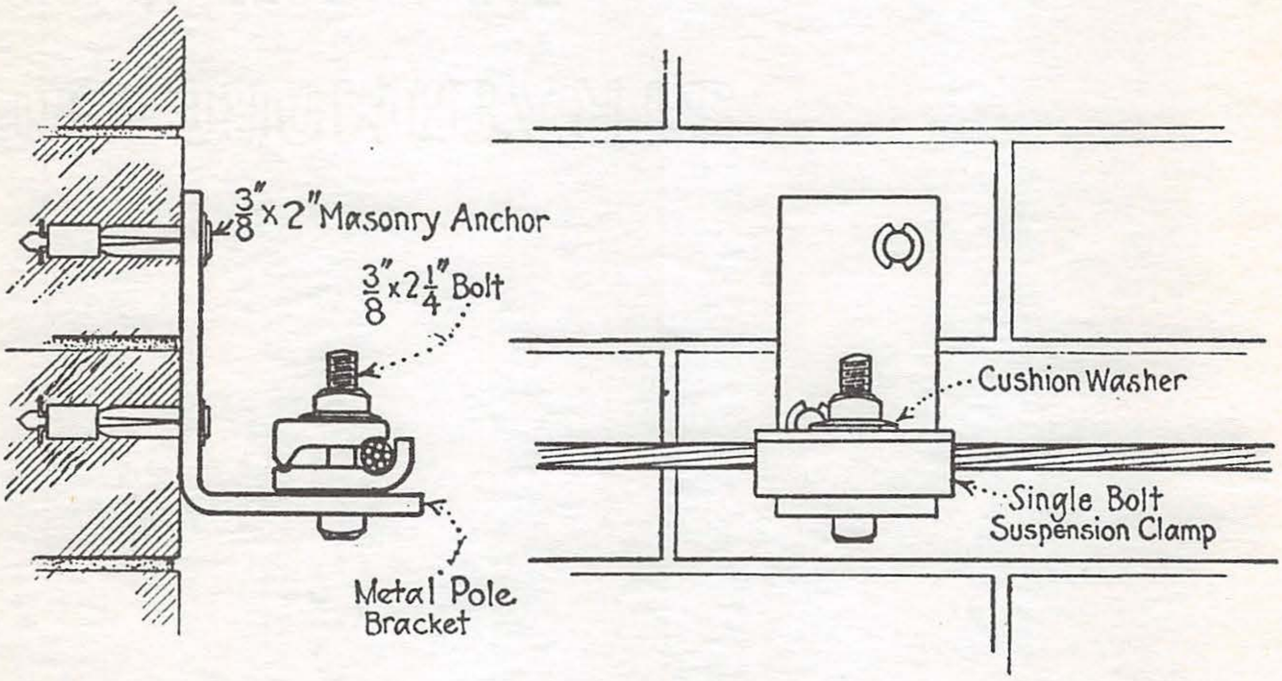
Note:-
Reinforcing Links should be attached along the center line of the pole at a point above the through bolt. They should extend slightly beyond the suspension clamp as shown.

Use of Reinforcing Links at Inside Corners

T & T 2683

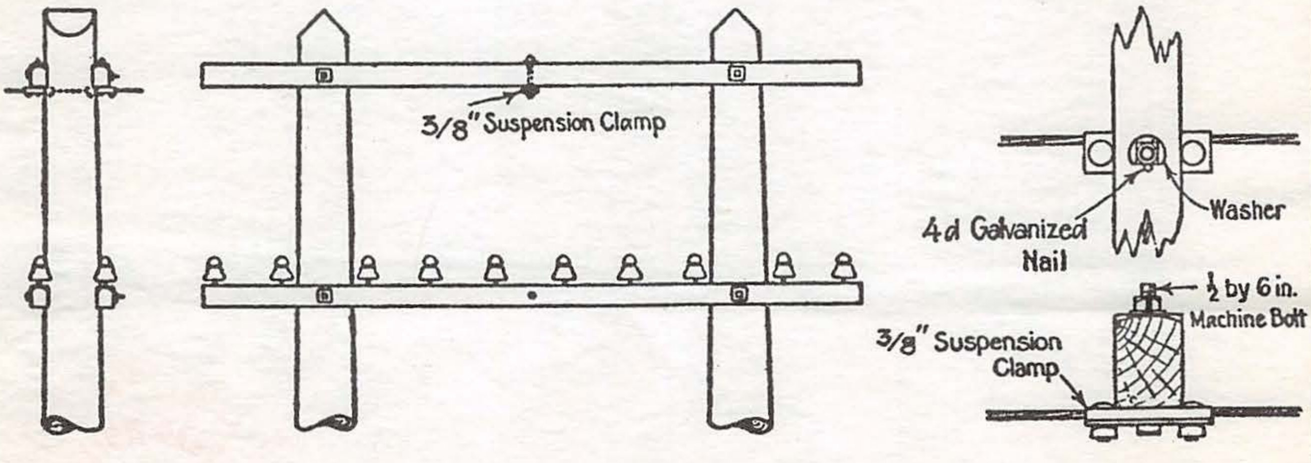
January, 1939

SPECIFICATION DEPT.
DEC
8
1947



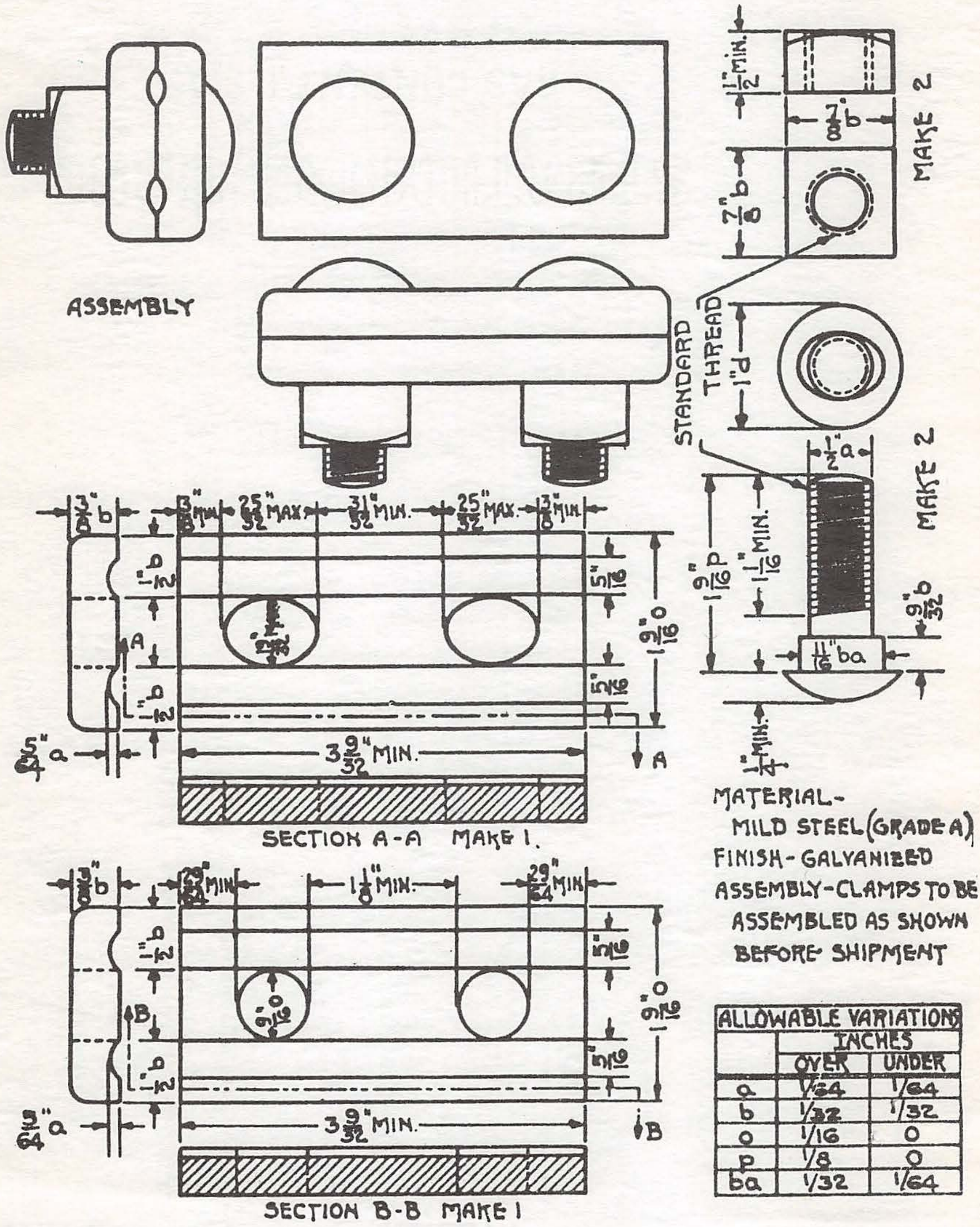
3/8" x 2" Masonry Anchor
3/8" x 2 1/4" Bolt
Metal Pole Bracket
Cushion Washer
Single Bolt Suspension Clamp

Use of Wall Bracket for Supporting Suspension Strand on Walls
T & T 2687
January, 1939



3/8" Suspension Clamp
4d Galvanized Nail
Washer
½ by 6 in. Machine Bolt
3/8" Suspension Clamp

Method of Attaching Suspension Strand to "H" Fixtures
T & T 2684
January, 1939


ASSEMBLY
1/2" MIN.
7/8" b
7/8" b
MAKE 2
STANDARD THREAD
1" d
1/2" a
MAKE 2
1 9/16" p
1 1/16" MIN.
9/32" b
11/16" ba
1/4" MIN.
3/8" b
3/8" MIN
25/32" MAX
31/32" MIN.
25/32" MAX.
3/8" MIN.
1/2" b
A
5/16"
5/16"
1 9/16" o
5/64" a
3 9/32" MIN.
A
SECTION A-A MAKE 1.
3/8" b
29/64" MIN
1 1/8" MIN.
29/64" MIN
1/2" b
B
5/16"
9/16" o
5/16"
1 9/16" o
3/64" a
3 9/32" MIN.
B
SECTION B-B MAKE 1

MATERIAL-
MILD STEEL (GRADE A)
FINISH - GALVANIZED
ASSEMBLY - CLAMPS TO BE
ASSEMBLED AS SHOWN
BEFORE SHIPMENT

ALLOWABLE VARIATIONS	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
o	1/16	0
p	1/8	0
ba	1/32	1/64

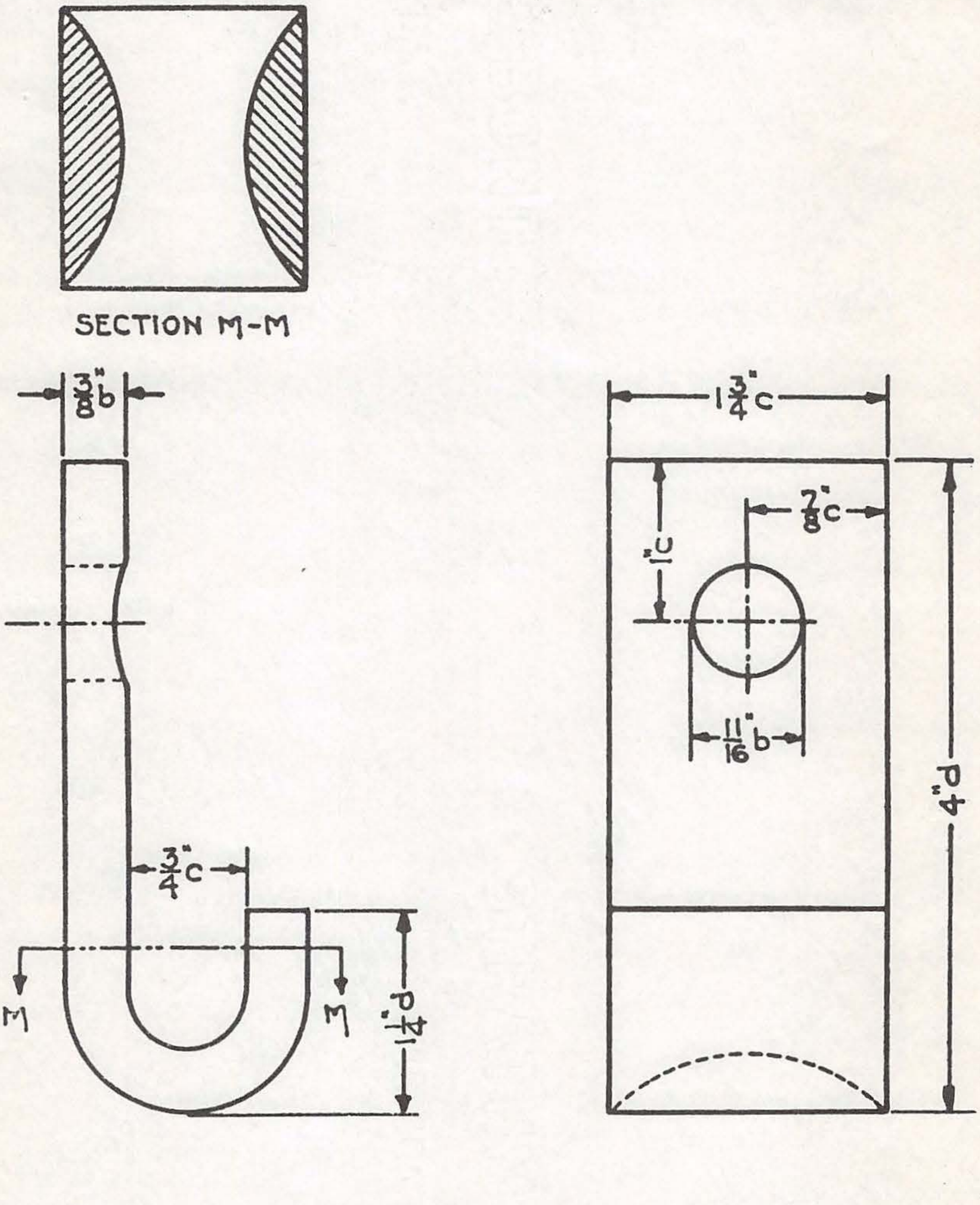
No Scale

S-514

TWO BOLT GUY CLAMP

T&T 1752

June, 1926


SECTION M-M
3/8" b
3/4" c
M
M
1 1/4" d
1 3/4" c
7/8" c
1" c
11/16" b
4" d

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED

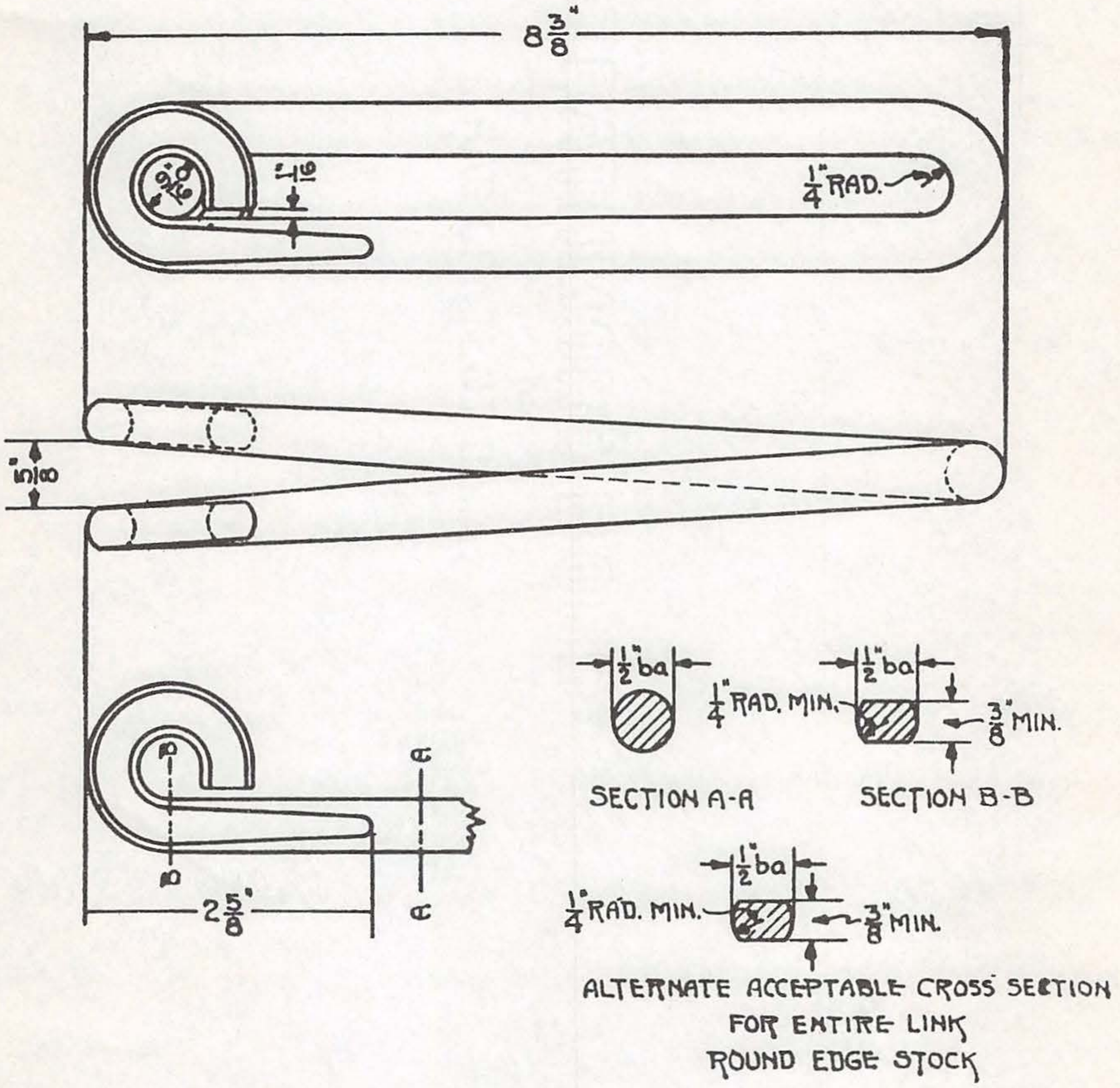
No Scale

GUY HOOK

T&T 1756

June, 1926

S-515


8 3/8"
9/16"
1/16"
1/4" RAD.
5/8"
B
B
A
A
2 5/8"
1/2" ba
SECTION A-A
1/2" ba
1/4" RAD. MIN.
3/8" MIN.
SECTION B-B
1/2" ba
1/4" RAD. MIN.
3/8" MIN.
ALTERNATE ACCEPTABLE CROSS SECTION
FOR ENTIRE LINK
ROUND EDGE STOCK

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
ba	1/32	1/64
O	1/16	0

MATERIAL-MILD STEEL (GRADE A)
FINISH-GALVANIZED

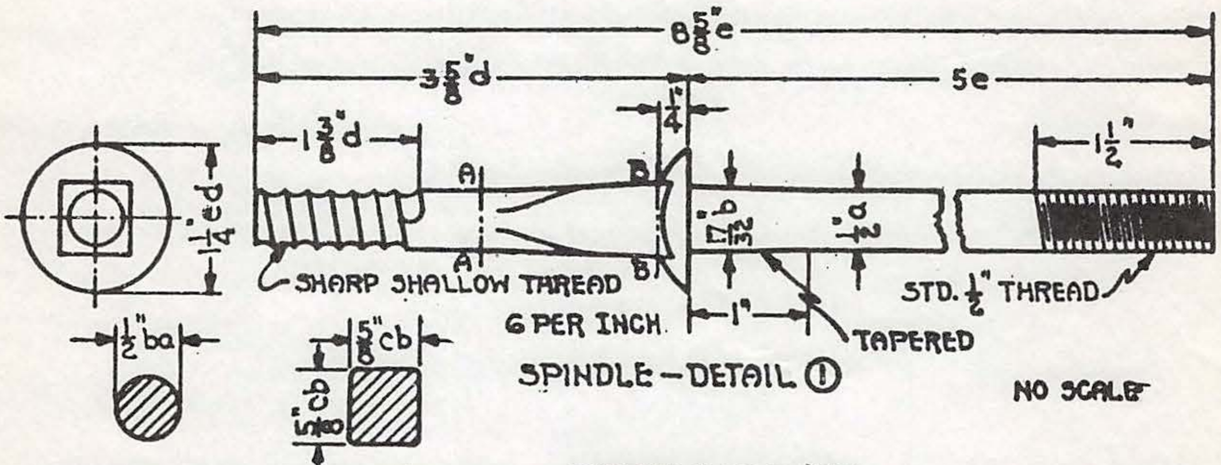
NO SCALE

S-516

MESSENGER REINFORCING LINK

June, 1926

T&T 1757

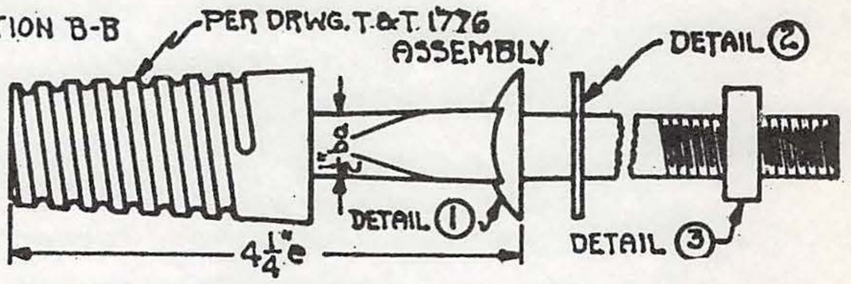

8 5/8" e
3 5/8" d
5e
1 3/8" d
1/4"
1 1/2"
1 1/4" ed
A
A
B
B
17/32" b
1/2" a
1"
SHARP SHALLOW THREAD
6 PER INCH
TAPERED
STD. 1/2" THREAD
1/2" ba
5/8" cb
5/8" cb

SPINDLE — DETAIL ①

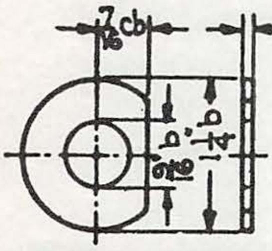
NO SCALE

SECTION A-A

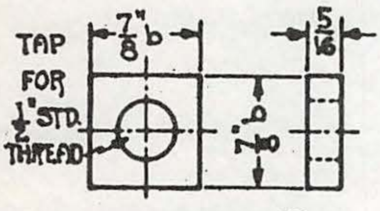
SECTION B-B


PER DRWG. T.&T. 1776
DETAIL ②
1/2" ba
DETAIL ①
DETAIL ③
4 1/4" e

ASSEMBLY


7/16 cb
3/32"
9/16" b
1 1/4" b

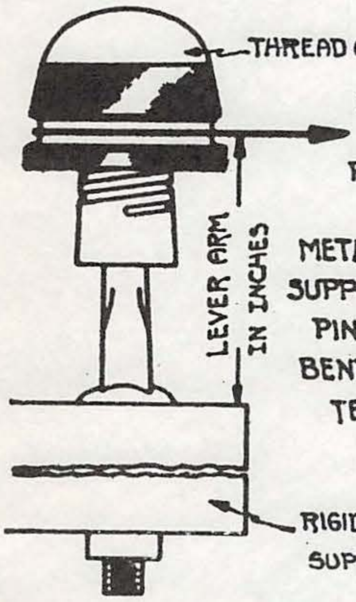
WASHER — DETAIL ②


7/8" b
5/16
TAP FOR 1/2" STD. THREAD
7/8" b

NUT — DETAIL ③

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
d	1/8	1/8
e	1/4	1/4
ba	1/32	1/64
cb	1/16	1/32
ed	1/4	1/8

MATERIAL – SPINDLE AND NUT
STEEL OF A GRADE SUCH THAT THE FINISHED PINS WILL CONFORM TO THE MECHANICAL REQUIREMENTS SPECIFIED HEREON.
WASHER – MILD STEEL (GRADE B)
FINISH – GALVANIZED
ASSEMBLY – SHIP ASSEMBLED AS SHOWN


THREAD GAGE
LOAD IN POUNDS
LEVER ARM IN INCHES
RIGID STEEL SUPPORT

METHOD OF SUPPORTING PIN FOR BENDING TEST

MECHANICAL REQUIREMENTS

BENDING TEST – THE PINS, WHEN HELD IN THE MANNER SHOWN HEREON, SHALL BE CAPABLE OF WITHSTANDING THE FOLLOWING LOAD WITHOUT CRACKING THE STEEL ON THE OUTSIDE OF THE BENT PORTION, AND WITHOUT DEFLECTING MORE THAN ONE (1) INCH AT A POINT THREE AND ONE-QUARTER (3¼) INCHES ABOVE THE BASE OF THE SHOULDER:

3250 ÷ LEVER ARM IN INCHES

THE BENDING TEST SHALL BE MADE WITH THE THREAD GAGE SECURELY TIGHTENED ON THE COB AND WITH THE LOAD APPLIED AT THE WIRE-GROOVE OF THE GAGE IN A DIRECTION AT RIGHT ANGLES TO THE AXIS OF THE PIN.

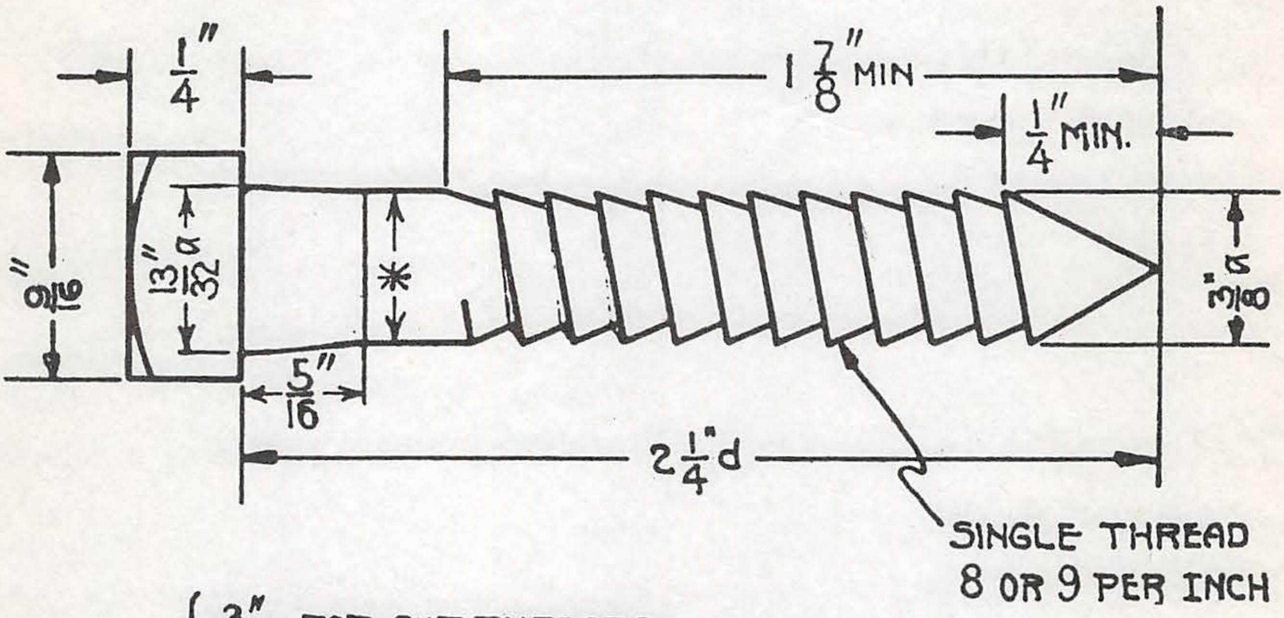
FIT OF COBS – THE COBS SHALL BE ASSEMBLED ON THE SPINDLES WITHOUT SPLITTING AND IN SUCH A MANNER THAT THEY WILL GRIP THE THREADS, THE GRIP BEING SUCH THAT THE COBS WILL NOT BE STRIPPED FROM THE SPINDLES WHEN SUBJECTED TO A LOAD OF THREE HUNDRED AND FIFTY (350) POUNDS.

S-517

½ INCH CROSSARM STEEL PIN

T&T
1759

June, 1926



1/4"
1 7/8" MIN
1/4" MIN.
9/16"
13/32" a
*
3/8" a
5/16"
2 1/4" d
SINGLE THREAD
8 OR 9 PER INCH

* 3/8" a FOR CUT THREADS
11/32" ba FOR ROLLED THREADS

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
d	1/8	1/8
ba	1/32	1/64

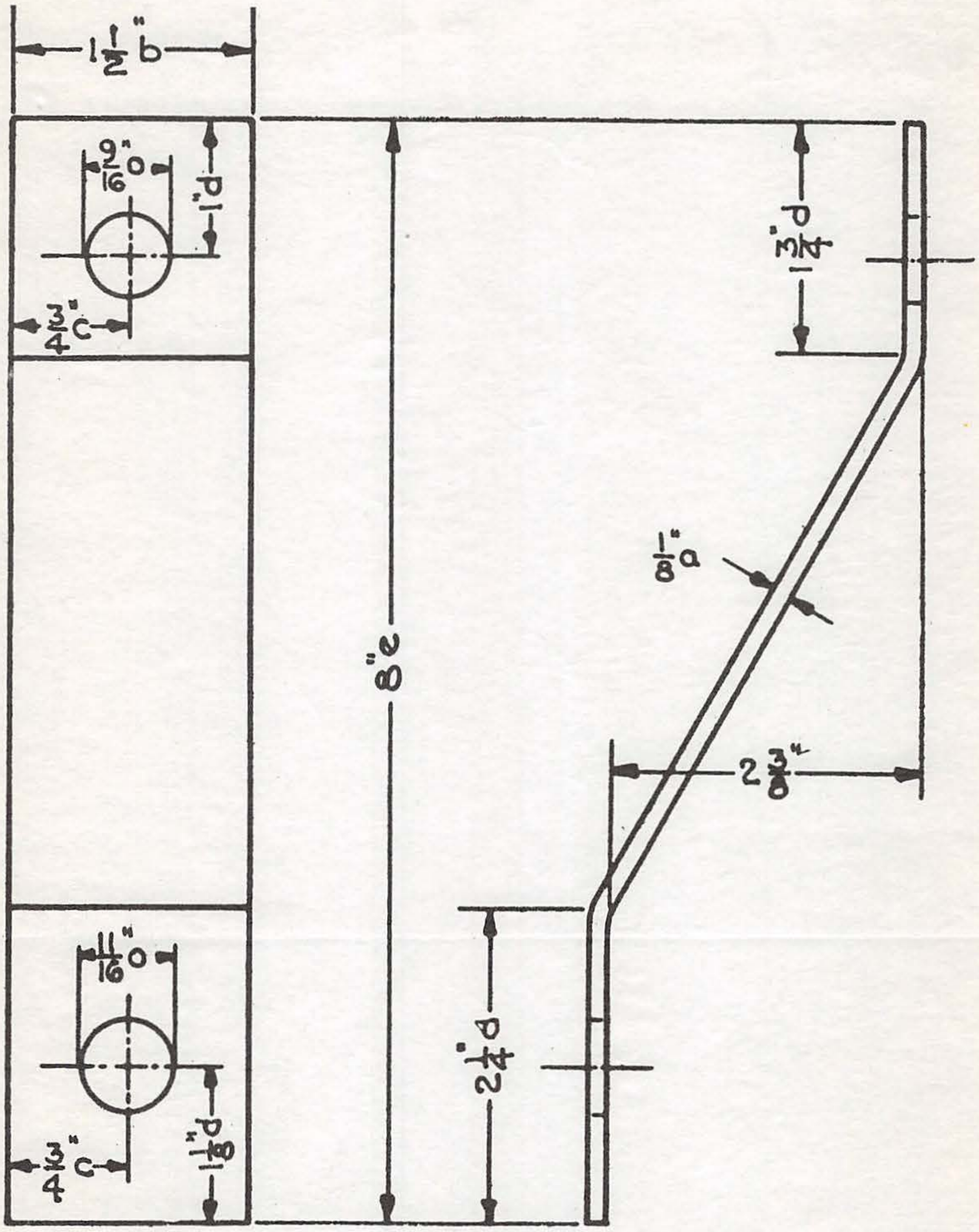
MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED

S-518

3/8-INCH FETTER DRIVE SCREW

T&T 1765

June, 1937 | June, 1926


1½" b
9/16" o
1" d
¾" c
8" e
1¾" d
⅛" a
2⅜"
11/16" o
2¼" d
1⅛" d
¾" c

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8
e	1/4	1/4
o	1/16	0

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED

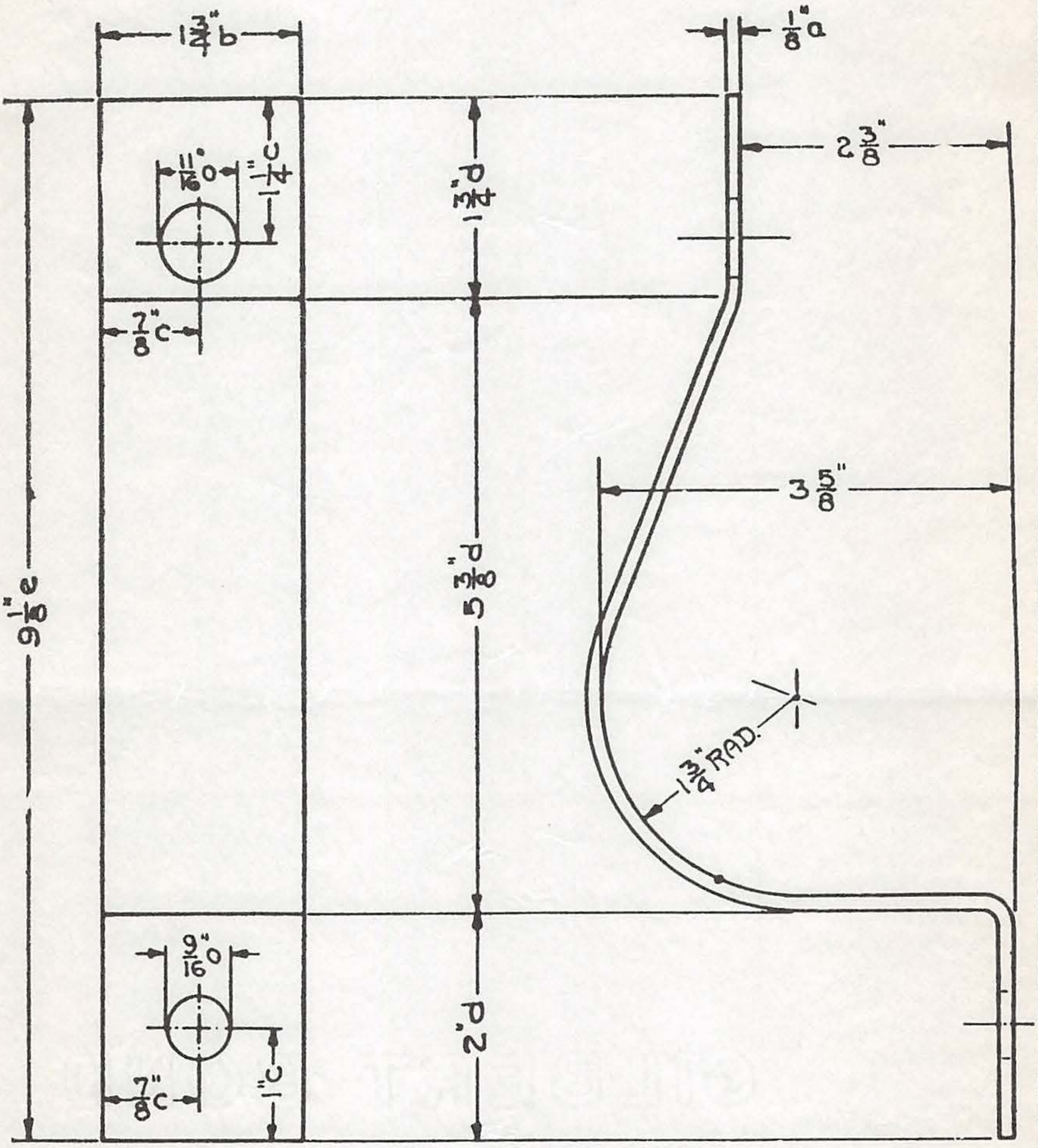
No Scale

S-519

REINFORCING STRAP

T&T 1768

June, 1926


1 3/4" b
1/8" a
2 3/8"
11/16" o
1 1/4" c
1 3/4" d
7/8" c
9 1/8" e
5 3/8" d
3 5/8"
1 3/4" RAD.
9/16" o
2" d
7/8" c
1" c

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8
e	1/4	1/4
o	1/16	0

MATERIAL - MILD STEEL (GRADE A)
FINISH - GALVANIZED

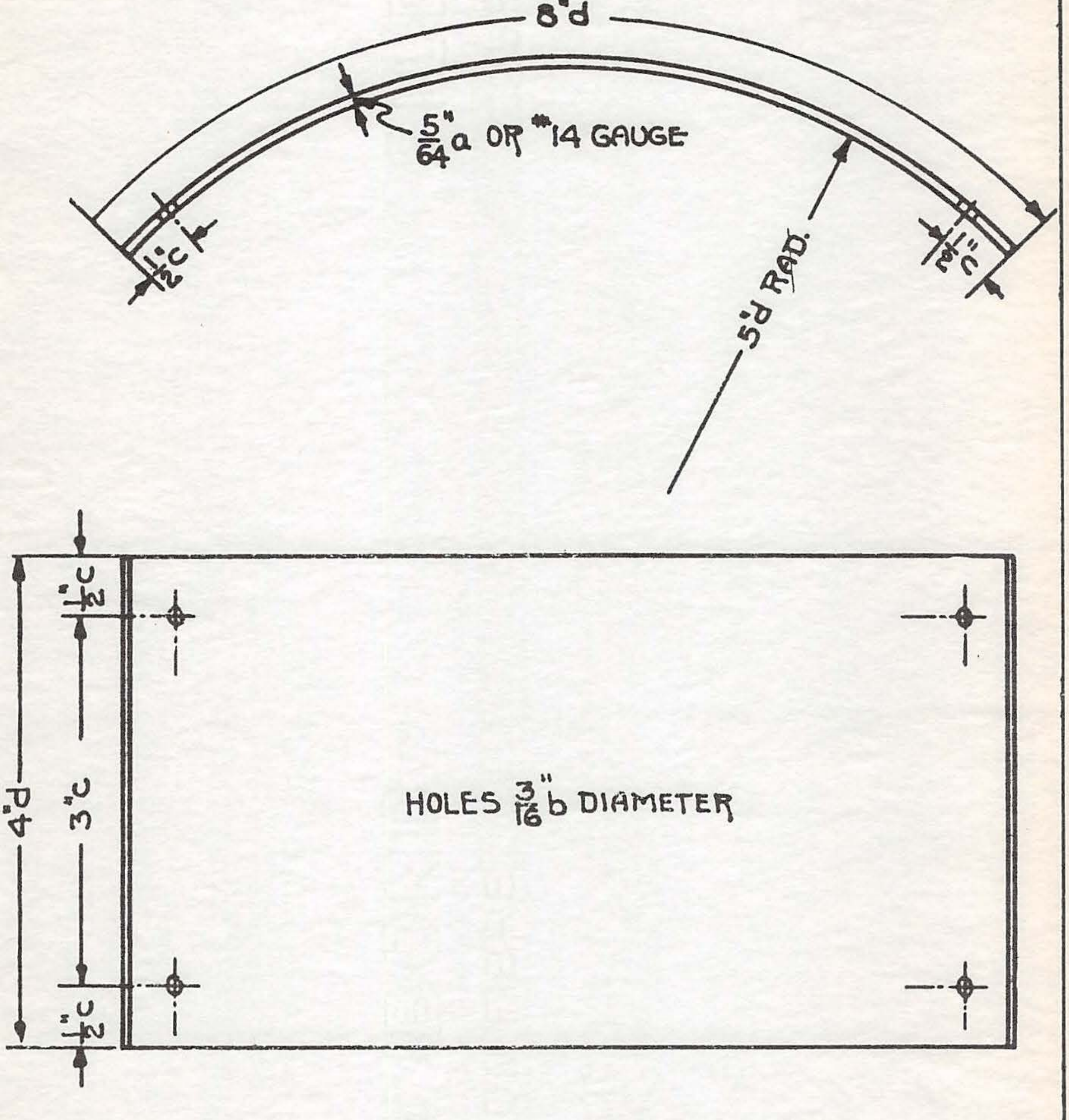
NO SCALE

S-520

SAFETY STRAP

T&T 1769

June, 1926


8"d
5/64"a OR #14 GAUGE
1/2"c
1/2"c
5"d RAD.
1/2"c
4"d
3"c
1/2"c
HOLES 3/16"b DIAMETER

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8

MATERIAL - MILD STEEL (GRADE B)
FINISH - GALVANIZED

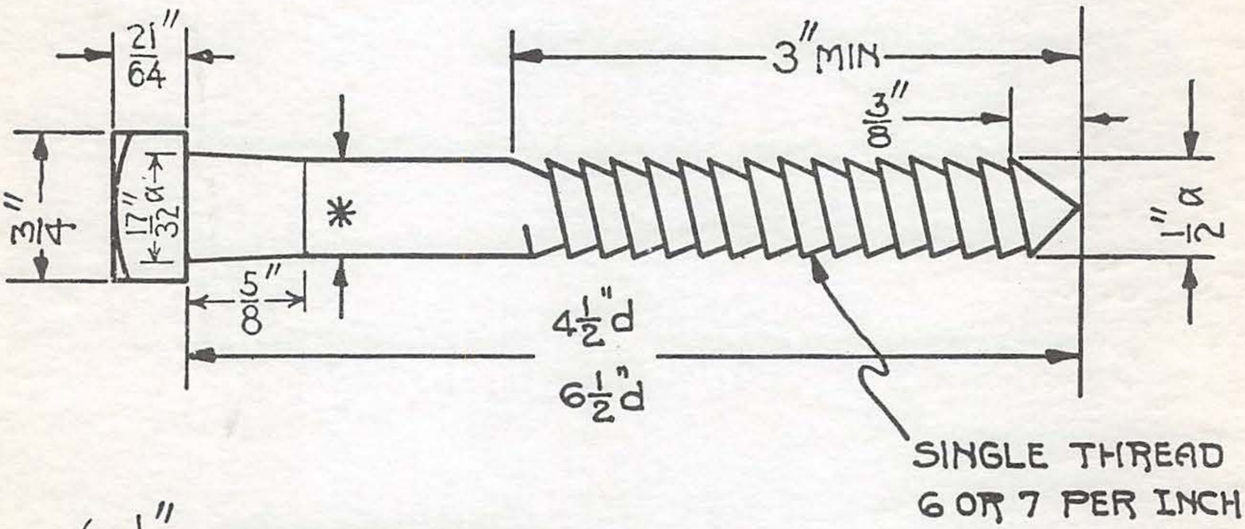
No Scale

GUY PLATE

T&T 1772

June, 1926

S-521


21"/64
3" MIN
3"/8
3"/4
17"/32 a
*
1"/2 a
5"/8
4 1/2" d
6 1/2" d
SINGLE THREAD
6 OR 7 PER INCH

* { 1/2" a FOR CUT THREADS
29"/64 ba FOR ROLLED THREADS

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
d	1/8	1/8
ba	1/32	1/64

MATERIAL-MILD STEEL (GRADE A)
FINISH-GALVANIZED

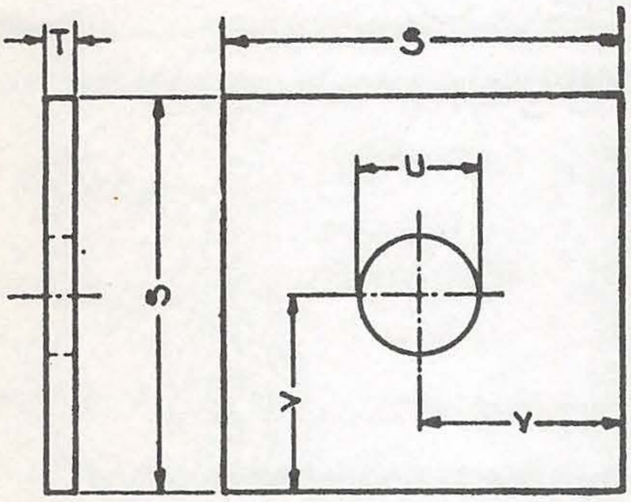
½-INCH FETTER DRIVE SCREW

June, 1937 | June, 1926

T&T
1766

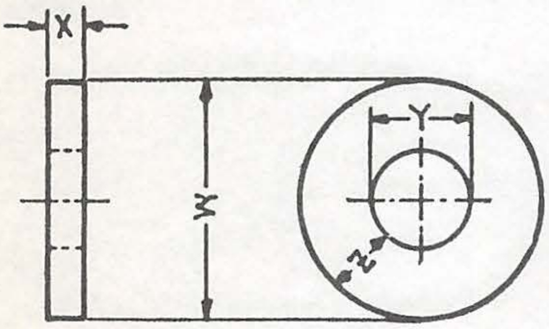
S-522

SPECIFICATION DEPT.
RECEIVED
JUN 8 1939



TYPE	USE	S	T	U	V
A	CROSSARM BOLTS DOUBLE ARMING • 1/2" GUY RODS	2¼"d	3/16"b	¾"b	1⅛"d
B	GUY RODS 5/8"	3"d	1/4"b	3/4"b	1½"d
C	" " 3/4"	4"d	1/4"b	7/8"b	2"d
D	" " 7/8" & 1"	4"d	1/2"b	1⅛"b	2"d

SQUARE WASHERS



TYPE	USE	W	X	Y	Z
G	CARRIAGE BOLTS EXTENSION FIXTURES CABLE RACKS CABLE BOXES	1⅜"c	7/64"a	9/16"b	13/32"c

ROUND WASHERS

ALLOWABLE VARIATIONS		
	INCHES	
	OVER	UNDER
a	1/64	1/64
b	1/32	1/32
c	1/16	1/16
d	1/8	1/8

MATERIAL - MILD STEEL (GRADE B)
FINISH - GALVANIZED

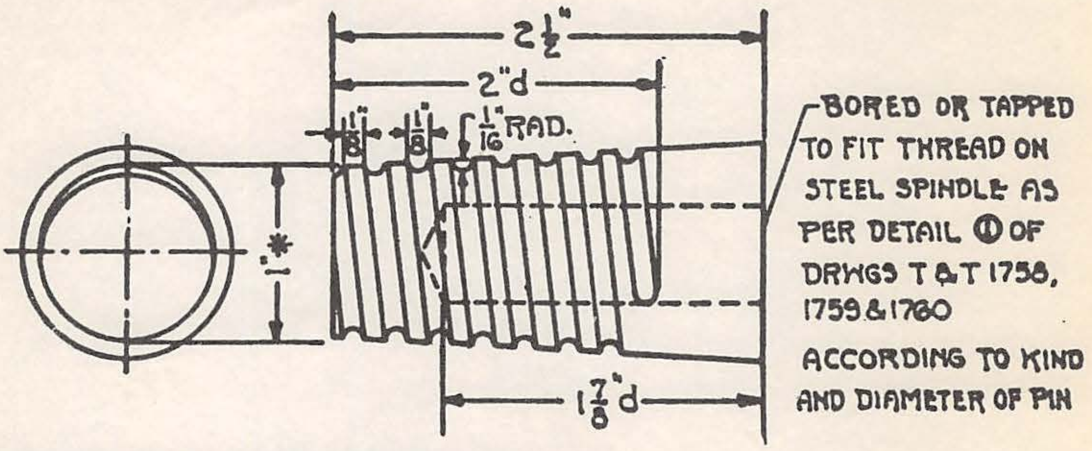
No Scale

WASHERS

T&T
1774

June, 1926

S-523


2½"
2"d
⅛"
⅛"
1/16" RAD.
*
1⅞"d
BORED OR TAPPED TO FIT THREAD ON STEEL SPINDLE AS PER DETAIL ① OF DRWGS T&T 1758, 1759&1760
ACCORDING TO KIND AND DIAMETER OF PIN

ALLOWABLE VARIATIONS			
	INCHES		* LIMITED BY THREAD GAGE DRWG. T&T.
	OVER	UNDER	
d	1/8	1/8	

THE COBS SHALL BE MADE OF SOUND WELL SEASONED OAK OR LOCUST FREE FROM SAPWOOD, BRASHY WOOD, UNSOUND KNOTS, CRACKS AND CHECKS. SOUND KNOTS NOT EXCEEDING ONE-QUARTER (1/4) INCH IN DIAMETER ARE PERMISSIBLE PROVIDED THEY ARE FIRMLY EMBEDDED. NOT MORE THAN FIVE (5) PER CENT OF THE COBS OF ANY LOT MAY CONTAIN A FEW SMALL ROUND WORM HOLES PROVIDED THEY ARE SCATTERED AND DO NOT EXCEED THREE THIRTY-SECONDS (3/32) INCH IN DIAMETER. THE GRAIN OF THE WOOD SHALL NOT DEPART FROM PARALLELISM WITH THE AXIS BY MORE THAN ONE-QUARTER (1/4) INCH IN THE LENGTH OF THE COB.

THE THREADS OF THE COB SHALL BE OF UNIFORM PITCH AND OF THE TYPE AND DIMENSIONS SHOWN HEREON. THE TAPER OF THE THREADS AND THE DIAMETER OF THE END THREAD OF THE COBS, AFTER THE COBS HAVE BEEN SUBJECTED TO THE TREATMENT SPECIFIED IN THE FOLLOWING PARAGRAPH, SHALL BE SUCH THAT WHEN THE THREAD GAGE, SHOWN ON DRAWING T&T 1775 IS TIGHTENED ON THE COB THE END OF THE COB WILL BE NOT MORE THAN FIVE SIXTEENTHS (5/16) INCH FROM THE CROWN OF THE THREAD IN THE GAGE. WHEN IN THIS POSITION THERE SHALL BE NO PERCEPTIBLE ROCKING OR PLAY OF THE GAGE ON THE COB, AND NOT LESS THAN TWO AND ONE-HALF TURNS SHALL BE REQUIRED TO REMOVE THE GAGE FROM THE COB.

THE COBS, BEFORE BEING FITTED TO THE SPINDLES, SHALL BE TREATED BY BOILING IN PARAFFIN WAX AT A TEMPERATURE OF FROM 220° TO 240° F. UNTIL THE FORMATION OF BUBBLES (CAUSED BY THE LIBERATION OF AIR AND MOISTURE) CEASES. THE COBS SHALL BE ENTIRELY SUBMERGED IN THE PARAFFIN DURING TREATMENT.

TO ACCOMPANY DRWGS. T&T 1758, 1759 & 1760

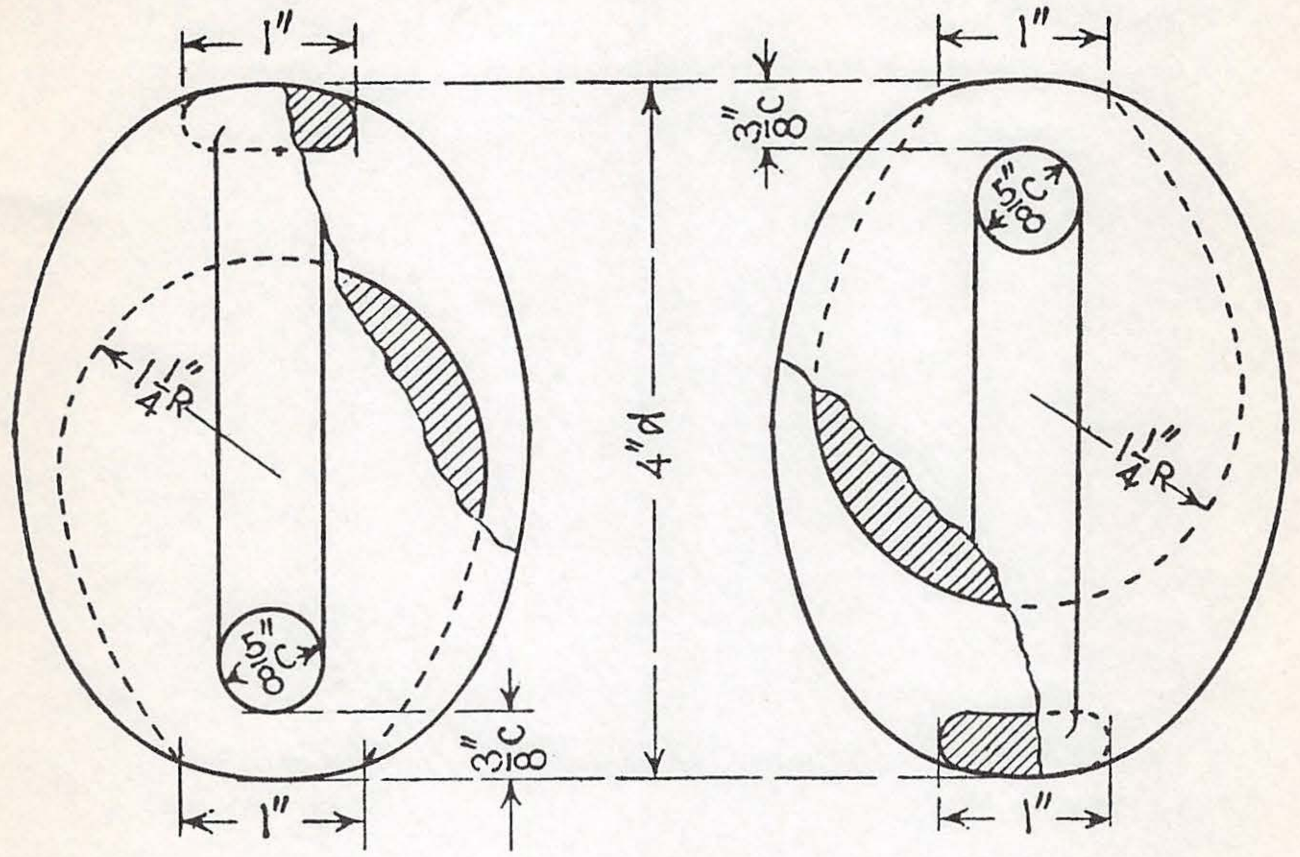
NO SCALE

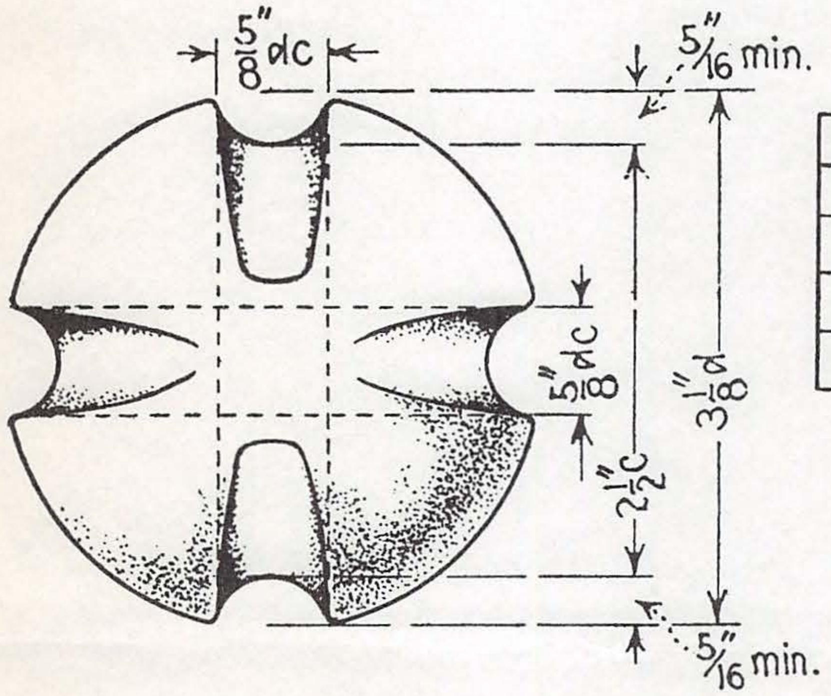
S-524

COBS FOR STEEL PINS

T&T 1776

June, 1926


1"
1"
3/8"c
4"d
1 1/4"R
5/8"c
5/8"c
1 1/4"R
3/8"c
1"
1"


5/8"dc
5/16" min.
5/8"dc
2 1/2"c
3 1/8"d
5/16" min.

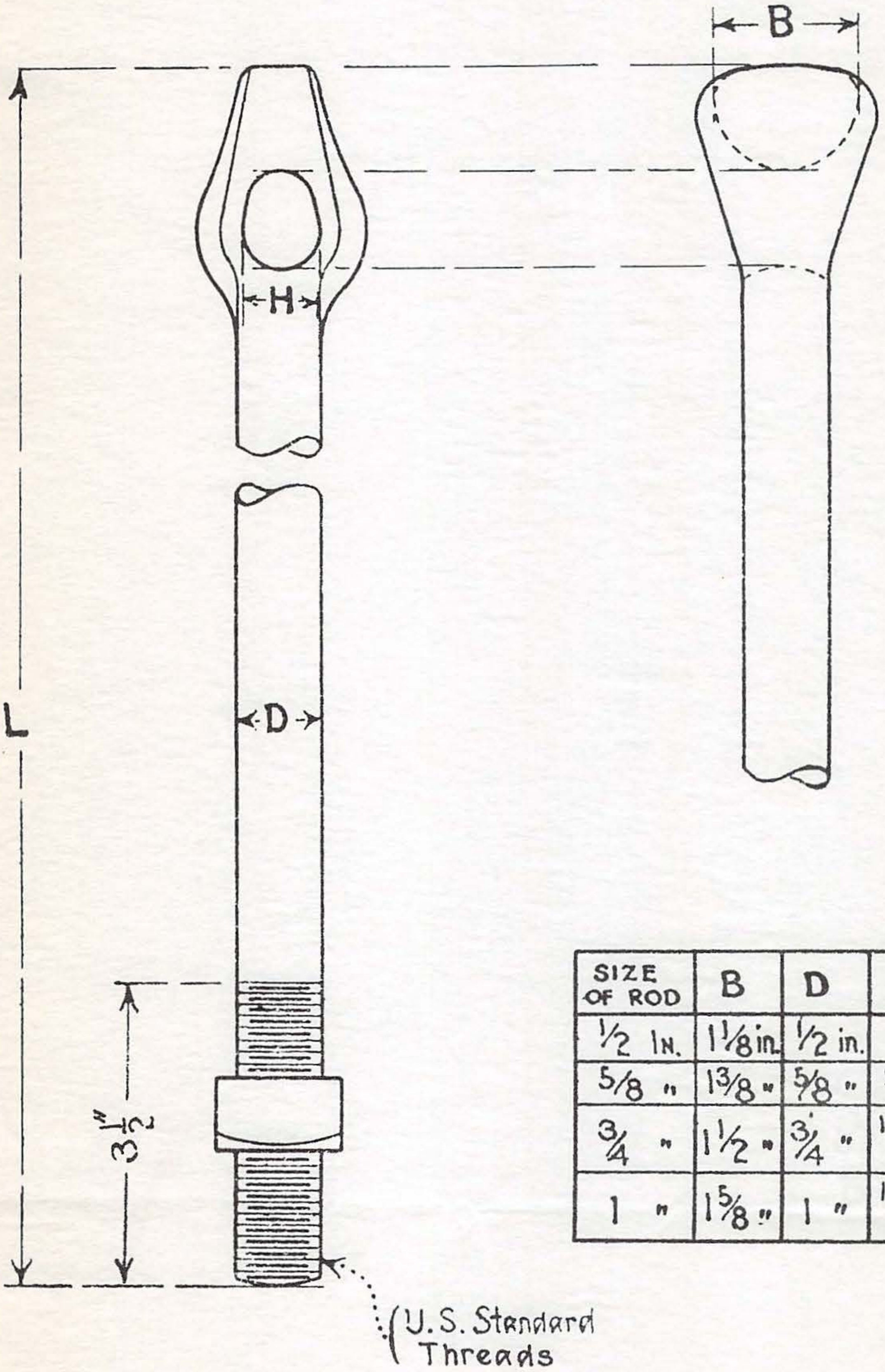
ALLOWABLE VARIATIONS		
	OVER	UNDER
c	1/16 in.	1/16 in.
d	1/8 "	1/8 "
dc	1/8 "	1/16 "

MATERIAL....... Shall be of a good grade of gray cast-iron.

FINISH............ Galvanized to withstand four immersions in accordance with A.S.T.M. Specification A-208.

MECHANICAL REQUIREMENTS..... Shall be reasonably symmetrical in form and shall have a reasonably smooth surface; shall be free from sand holes and other defects which would be detrimental to their strength or serviceability.

Cast Iron Strand Connector
T & T 1804
June, 1927; June, 1940


B
H
D
L
3½"
U.S. Standard Threads

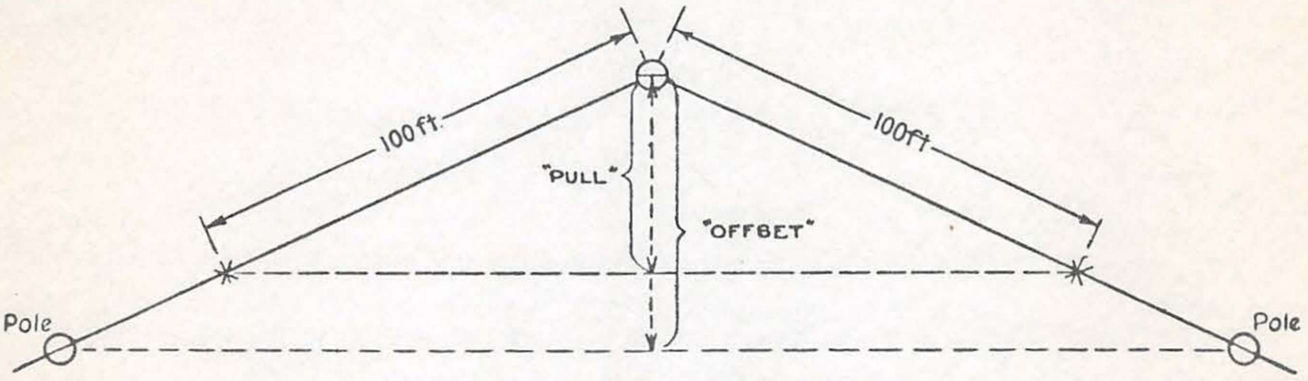
SIZE OF ROD	B	D	H	L
½ In.	1⅛ in.	½ in.	7/16 in	6'-0"
⅝ "	1⅜ "	⅝ "	9/16 "	7'-0"
¾ "	1½ "	¾ "	11/16 "	8'-0"
1 "	1⅝ "	1 "	13/16 "	8'-0"

Material - Mild Steel (Grade A)
Finish--- Galvanized
Assembly--- Before packing, nut to be run down at least half the length of the threads.

Thimbleless Guy Rods
T & T 2788
June, 1940

S-526

RECEIVED
FEB 28 1950
SPECIFICATION DEPT.



Method of Determining "Pull" at a Corner Pole

T & T 2622

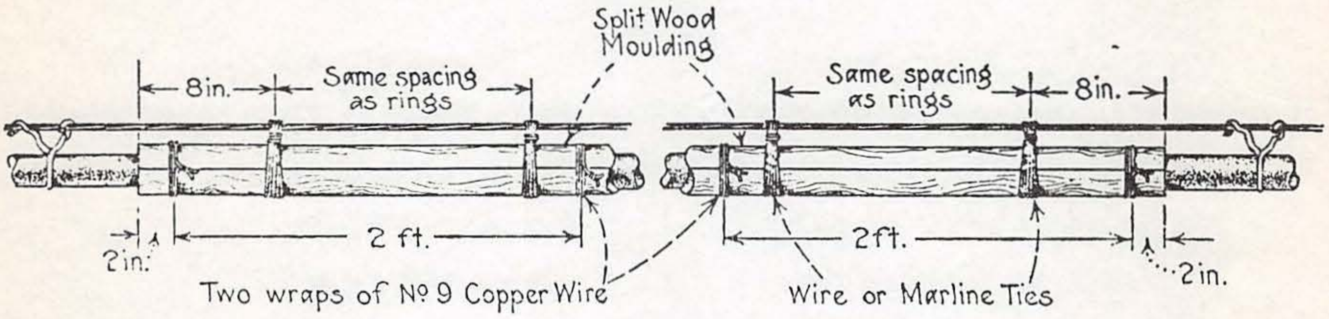
January, 1939

The "pull" on a corner may be determined directly by means of a corner gage where this instrument is available; otherwise, the "pull" may be determined by measuring the distance a pole is out of line with two points located 100 feet away, as described above, or it may be determined by measuring the "offset" or distance the corner pole is out of line with the adjacent poles, and then finding the actual "pull" from Table D-1.

Table D-1

Determining "Pull"

"Offset" in Feet as Measured	Average Length of Spans Next to Corner Pole, in Feet											
	50	60	70	80	90	100	110	120	130	150	175	200
	"Pull" Based on 100 Feet Distances											
2	4	3	3	3	2	2	2	2	2	2	1	1
4	8	7	6	5	4	4	4	3	3	3	2	2
6	12	10	9	8	7	6	5	5	5	4	3	3
8	16	13	11	10	9	8	7	7	6	5	5	4
10	20	17	14	13	11	10	9	8	8	7	6	5
12	24	20	17	15	13	12	11	10	9	8	7	6
14	28	23	20	18	16	14	13	12	11	9	8	7
16	32	27	23	20	18	16	14	13	12	11	9	8
18	36	30	26	23	20	18	16	15	14	12	10	9
20	40	33	29	25	22	20	18	17	15	13	11	10
22	—	37	31	27	24	22	20	18	17	15	13	11
24	—	40	34	30	27	24	22	20	18	16	14	12
26	—	—	37	33	29	26	24	22	20	17	15	13
28	—	—	40	35	31	28	25	23	22	19	16	14
30	—	—	—	38	33	30	27	25	23	20	17	15
32	—	—	—	40	36	32	29	27	25	21	18	16
34	—	—	—	—	38	34	31	28	26	23	19	17
36	—	—	—	—	40	36	33	30	28	24	21	18
38	—	—	—	—	—	38	35	32	29	25	22	19
40	—	—	—	—	—	40	36	33	31	27	23	20
42	—	—	—	—	—	—	38	35	32	28	24	21
44	—	—	—	—	—	—	40	37	34	29	25	22
46	—	—	—	—	—	—	—	38	35	31	26	23
48	—	—	—	—	—	—	—	40	37	32	27	24
50	—	—	—	—	—	—	—	—	38	33	28	25

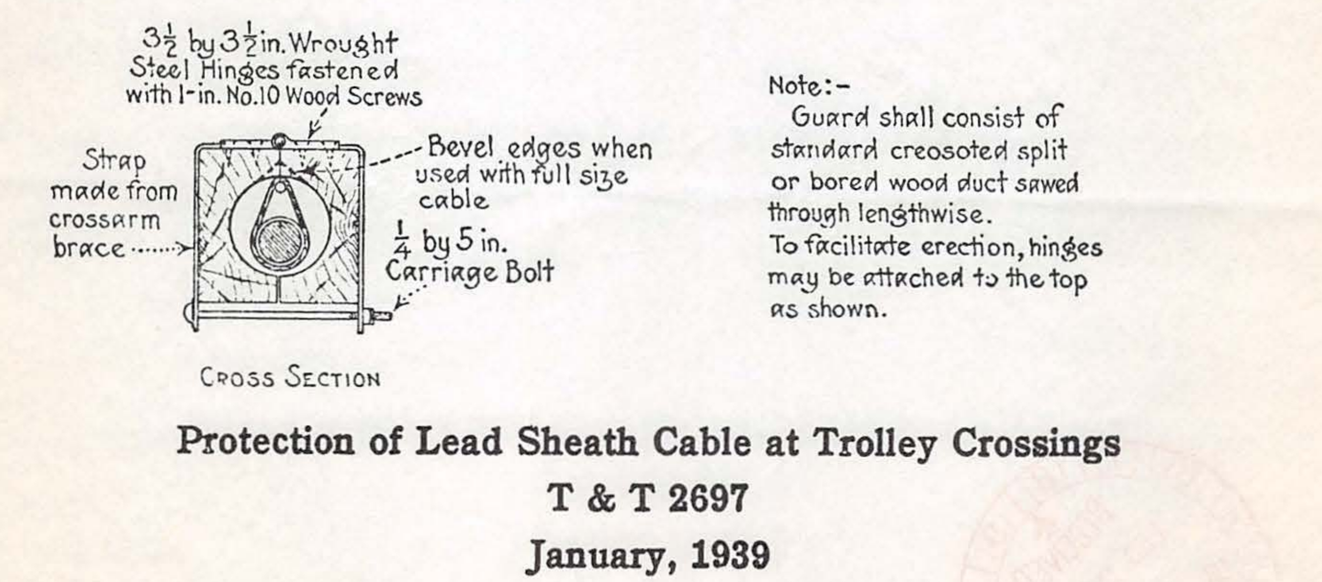

Split Wood Moulding
8 in.
Same spacing as rings
Same spacing as rings
8 in.
2 in.
2 ft.
2 ft.
2 in.
Two wraps of No. 9 Copper Wire
Wire or Marline Ties

Protection of Cable by Means of Wood Moulding

T & T 2696

January, 1939

Where a cable is carried over a trolley contact conductor, and a sufficient separation cannot be provided to preclude the possibility of a trolley pole coming into contact with the cable or strand, a cable guard should be placed over both cable and strand. (See Drawing T & T 2697)


6 ft.
$4\frac{1}{2}$ in.
21 in.
21 in.
21 in.
$4\frac{1}{2}$ in.
8 in.
Hinge
Hinge
8 in.
Marline Ties
Wire or marline wrapping to support cable until guard is installed
$3\frac{1}{2}$ by $3\frac{1}{2}$ in. Wrought Steel Hinges fastened with 1-in. No. 10 Wood Screws
Strap made from crossarm brace
Bevel edges when used with full size cable
$\frac{1}{4}$ by 5 in. Carriage Bolt
Cross Section

Note:-
Guard shall consist of standard creosoted split or bored wood duct sawed through lengthwise.
To facilitate erection, hinges may be attached to the top as shown.

Protection of Lead Sheath Cable at Trolley Crossings

T & T 2697

January, 1939

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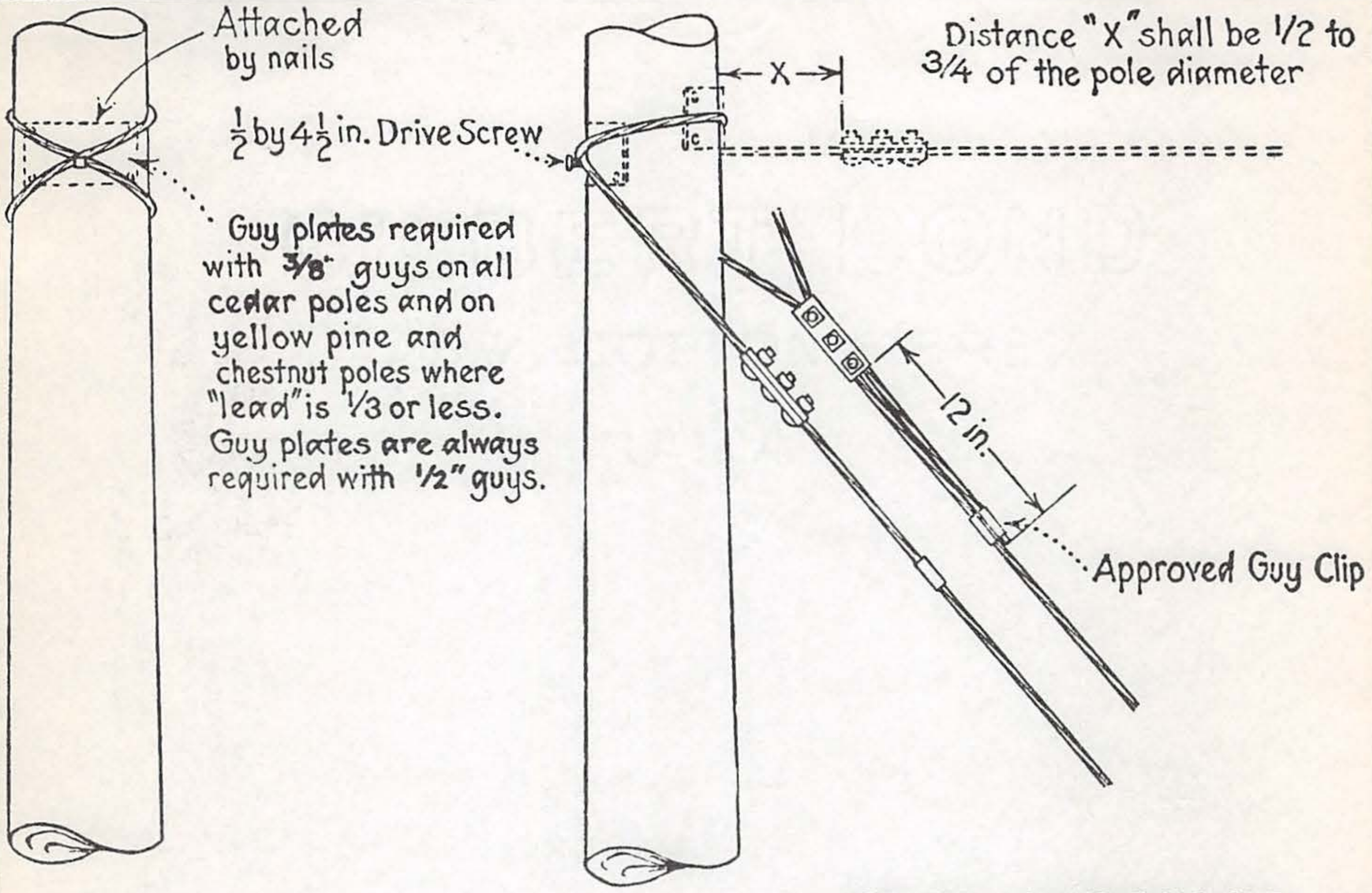
FEB 23 1939
SPECIFICATION DEPT.


Attached by nails
½ by 4½ in. Drive Screw
X
12 in.
Approved Guy Clip

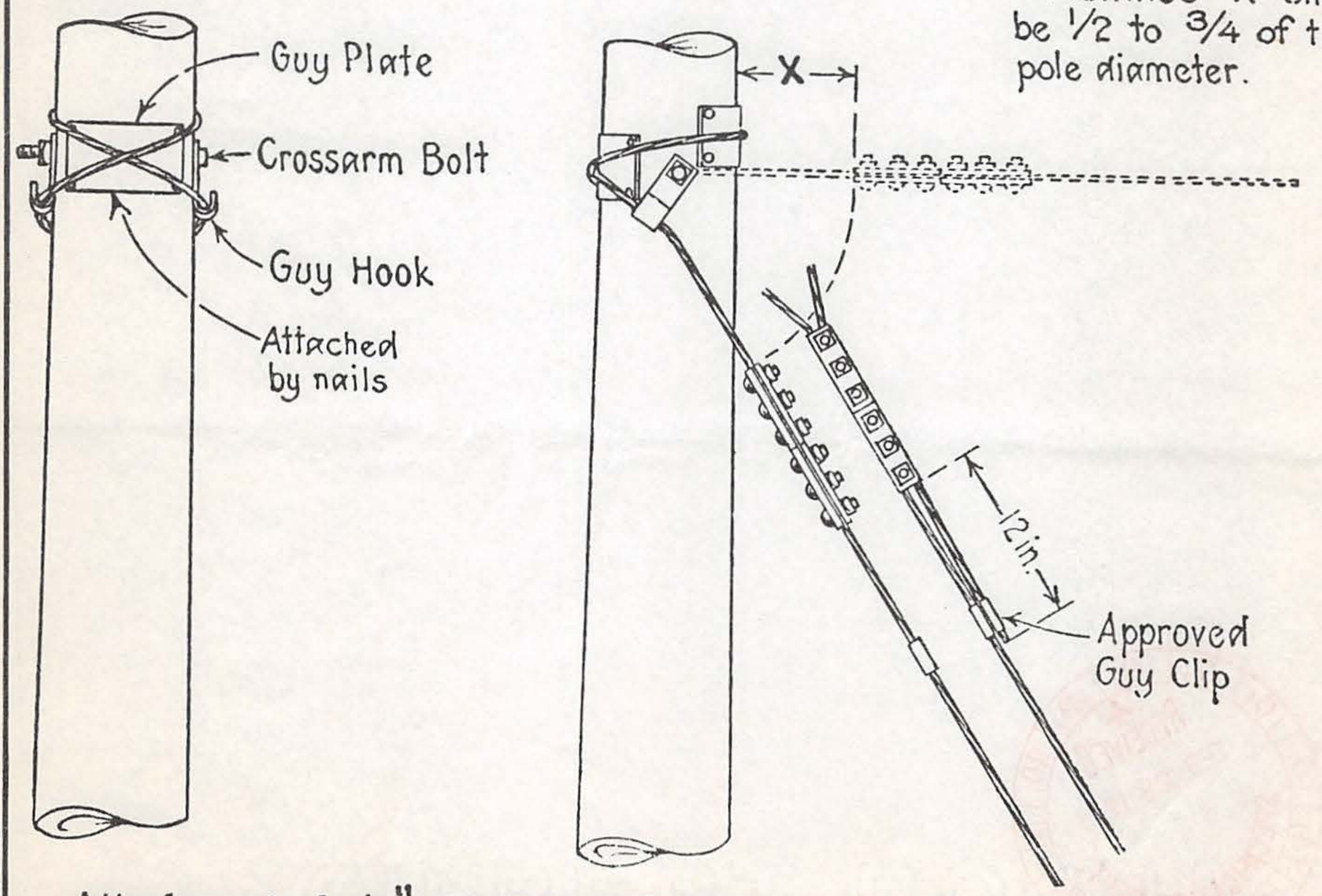
Distance "X" shall be 1/2 to 3/4 of the pole diameter

Guy plates required with 3/8" guys on all cedar poles and on yellow pine and chestnut poles where "lead" is 1/3 or less. Guy plates are always required with 1/2" guys.

SIZE OF STRAND	NUMBER AND SIZE OF CLAMPS
3/8"	1-Three Bolt, Heavy
1/2"	2- " " , "

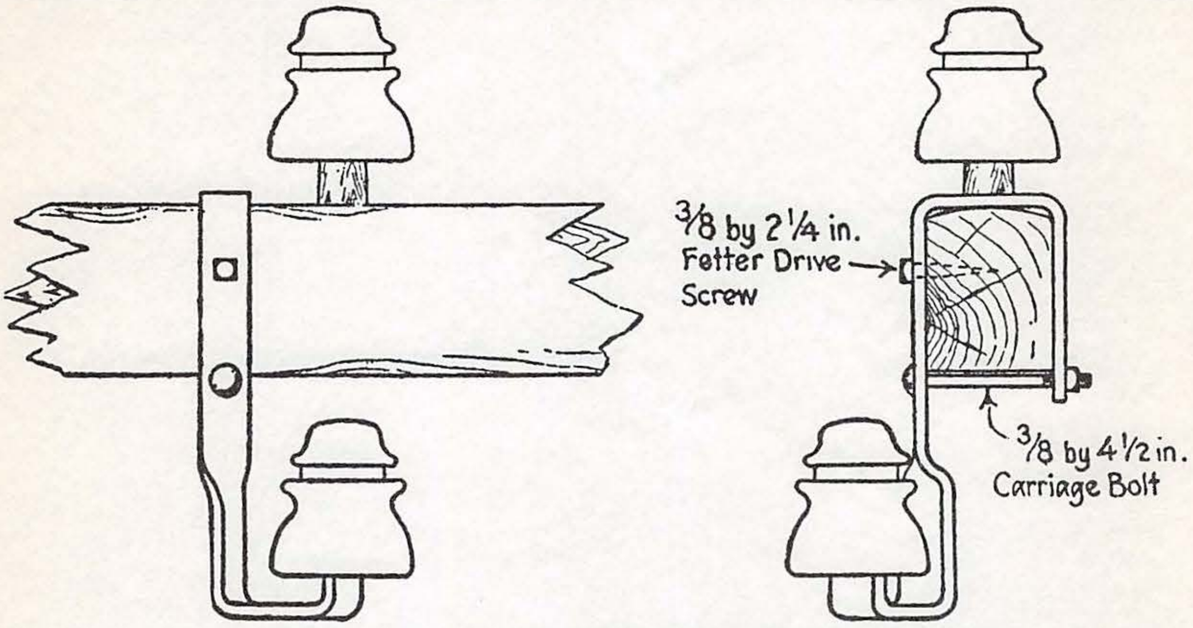
Attachment of 3/8" Guys and 1/2" Guys Where Guy Hooks Are Not Required
T & T 2651
January, 1939

Distance "X" shall be 1/2 to 3/4 of the pole diameter.


Guy Plate
Crossarm Bolt
Guy Hook
Attached by nails
X
12 in.
Approved Guy Clip

Attachment of 1/2" Guys to Poles Where Guy Hooks Are Required
T & T 2652

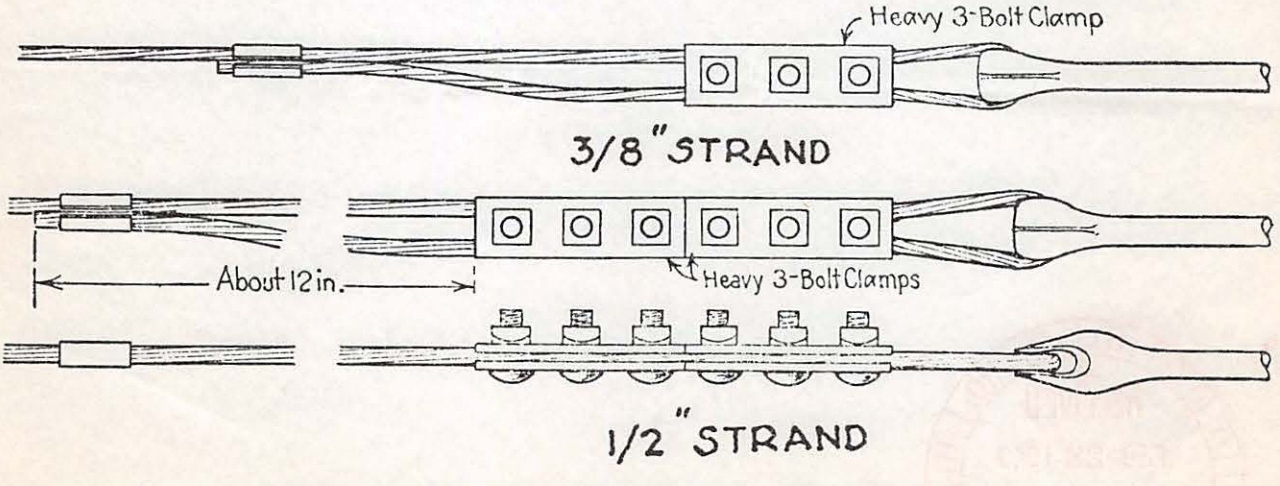
S-529


3/8 by 2 1/4 in.
Fetter Drive Screw
3/8 by 4 1/2 in.
Carriage Bolt

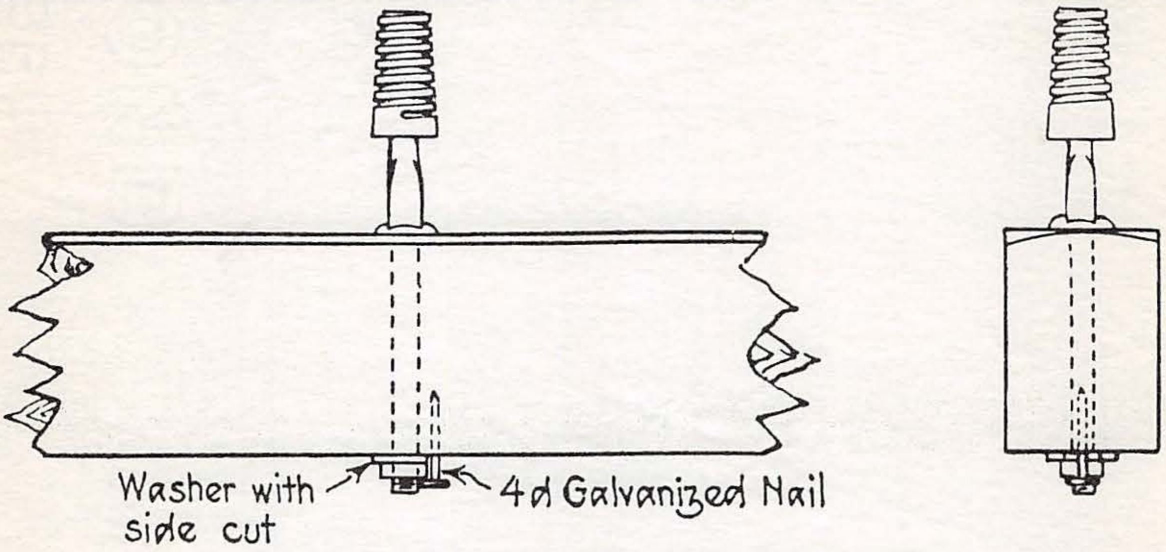
Installing Single Circuit Transposition Brackets
T & T 2642
January, 1939

Method of Attaching Guys to Guy Rods. The method of attaching guys to standard thimble eye guy rods is illustrated in Drawing T & T 2656. Where No. 6 B.W.G. steel wire is used for a guy, it shall be threaded through and looped around the eye of the rod and given ten turns about itself in the same manner as when this wire is attached to poles. (See Drawing T & T 2650) Where guys are to be attached to existing rods which do not have the thimble eye, standard guy thimbles of the proper size should be used in all cases.

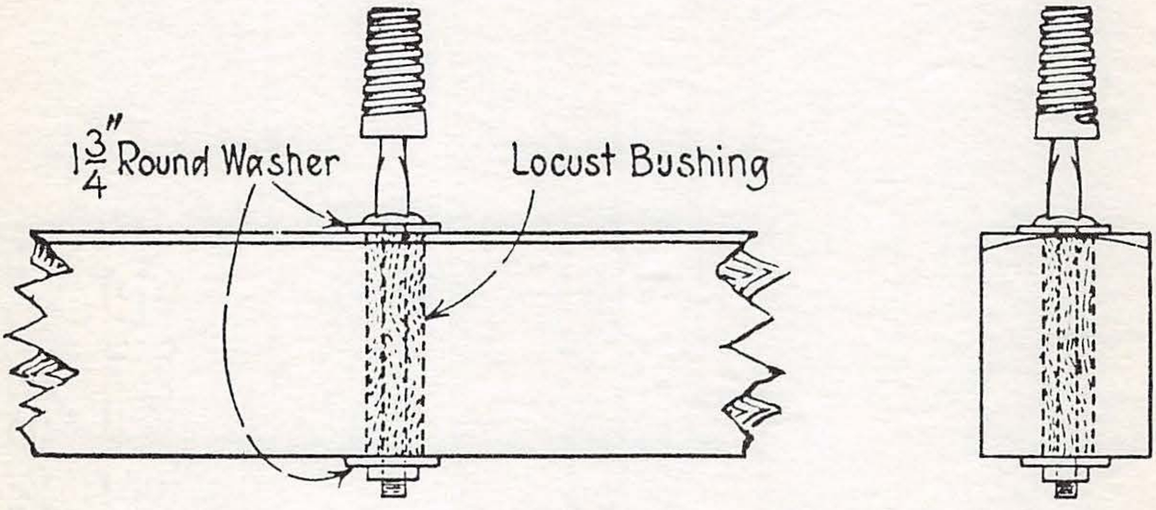
Note :-
Space clamps as close to thimble-eye as practicable.


Heavy 3-Bolt Clamp
3/8" STRAND
About 12 in.
Heavy 3-Bolt Clamps
1/2" STRAND

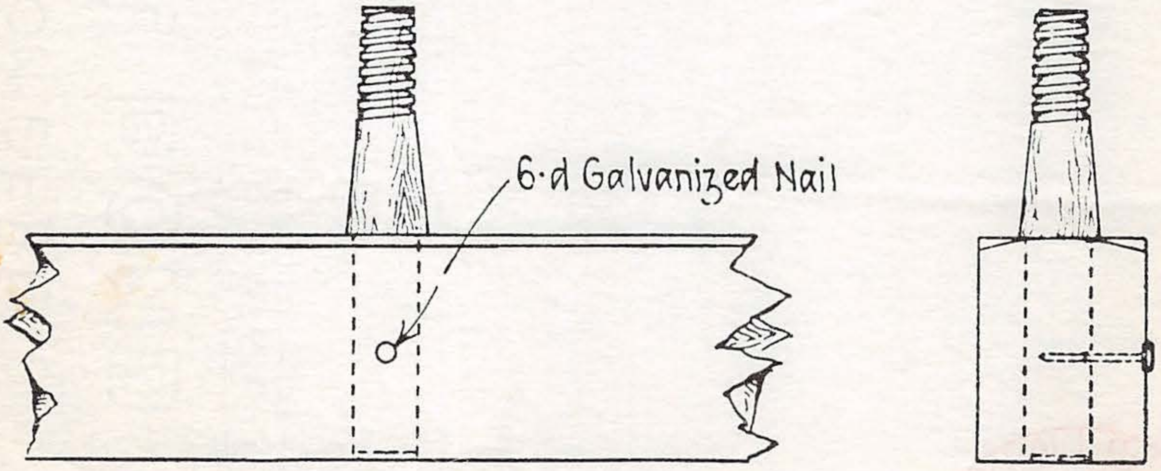
Method of Attaching Guys to Guy Rods
T & T 2656
January, 1939


Washer with side cut
4 d Galvanized Nail

Steel Pin Installed in Steel Pin Arm


$1\frac{3}{4}''$ Round Washer
Locust Bushing

Steel Pin Installed in Wood Pin Arm

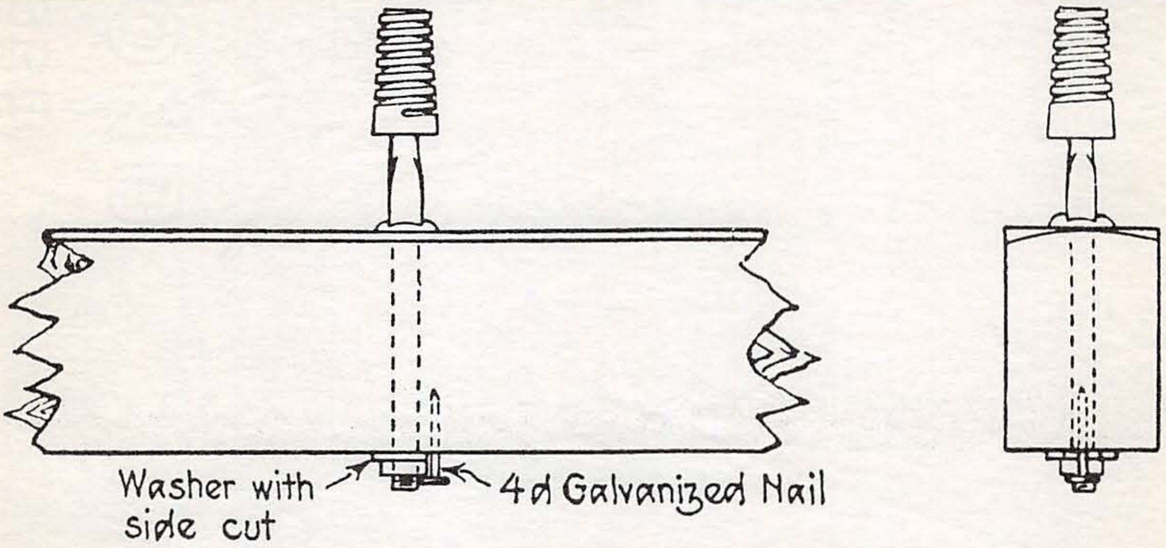

6-d Galvanized Nail

Wood Pin Installed in Wood Pin Arm

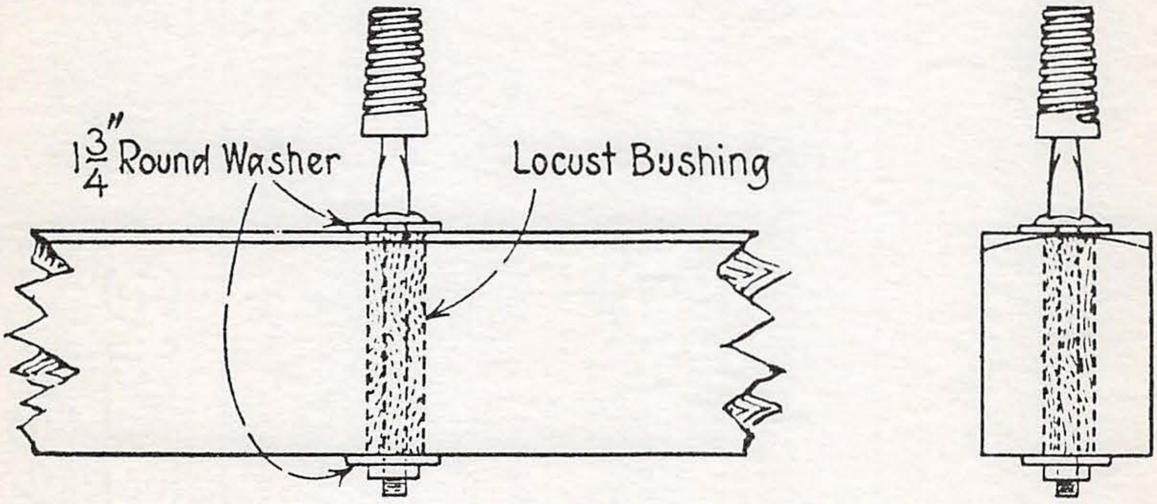
Installing Wood and Steel Pins

T & T 2640

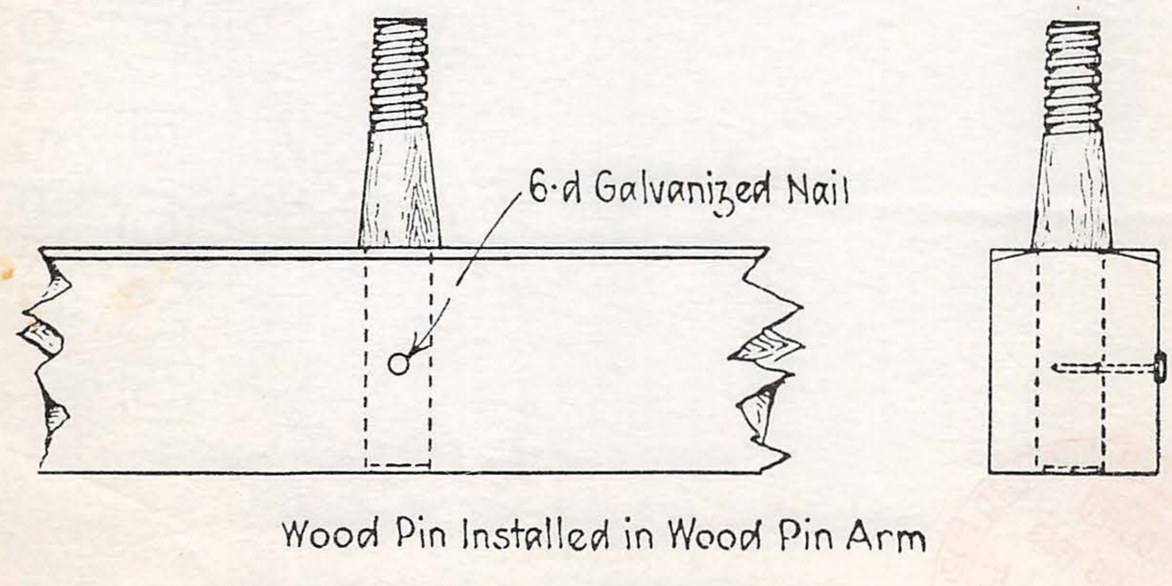
January, 1939


Washer with side cut
4 d Galvanized Nail

Steel Pin Installed in Steel Pin Arm


1 3/4" Round Washer
Locust Bushing

Steel Pin Installed in Wood Pin Arm


6-d Galvanized Nail

Wood Pin Installed in Wood Pin Arm

Installing Wood and Steel Pins
T & T 2640
January, 1939

S-531

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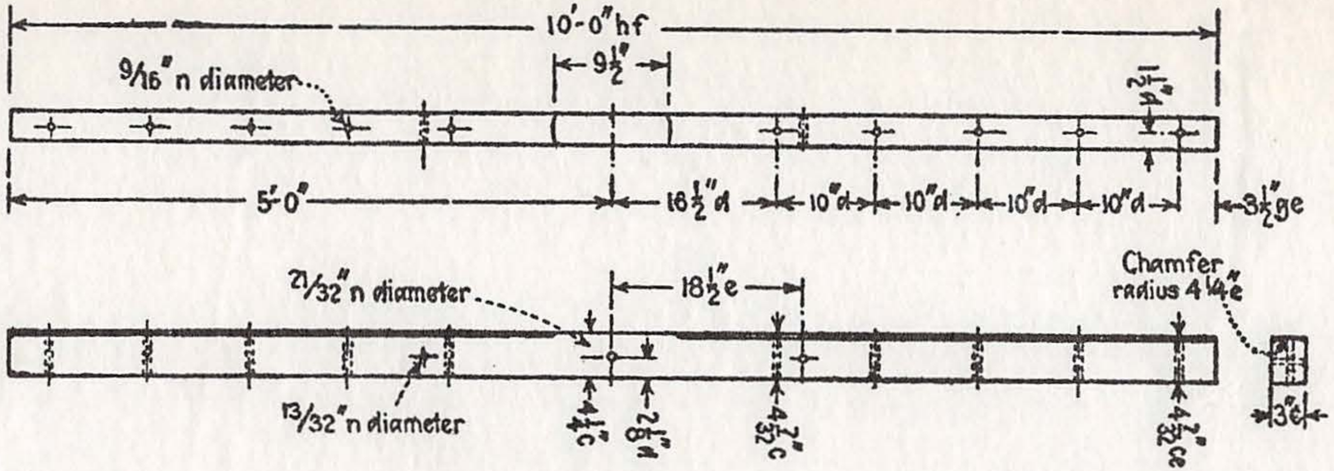
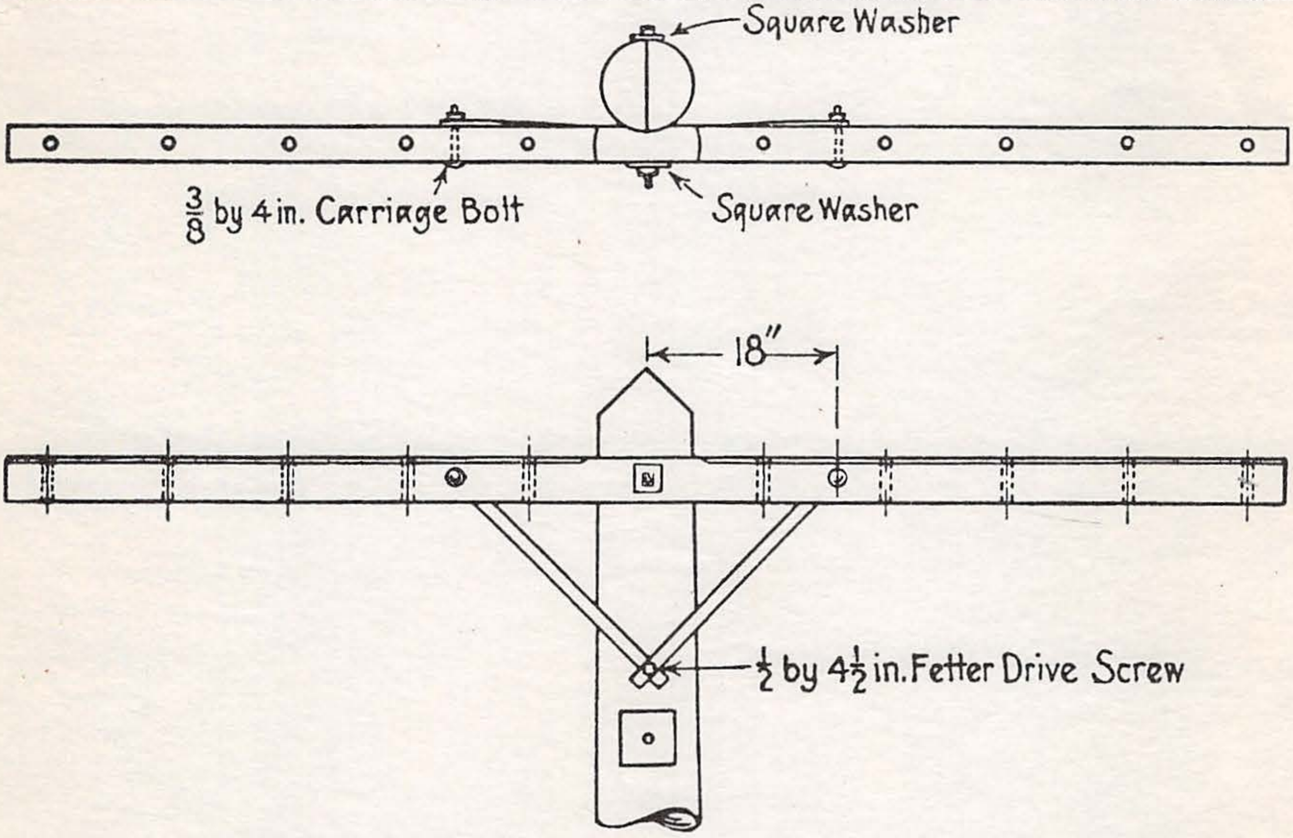
SPECIFICATION DEPT.


10'-0" hf
9½"
9/16" n diameter
2½" d
5'-0"
16½" d
10" d
10" d
10" d
10" d
3½" ge
21/32" n diameter
18½" e
Chamfer radius 4¼" e
13/32" n diameter
4¼" c
2⅛" d
4 7/32" c
4 7/32" ce
3" e

ALLOWABLE VARIATIONS		
	OVER	UNDER
c	1/16 in.	1/16 in.
d	1/8 "	1/8 "
e	1/4 "	1/4 "
n	1/32 "	0
ce	1/16 "	1/4 "
ge	3/8 "	1/4 "
hf	3/4 "	1/2 "

Special 10 Ft. Crossarms for Steel Pins
T & T 2790
June, 1940

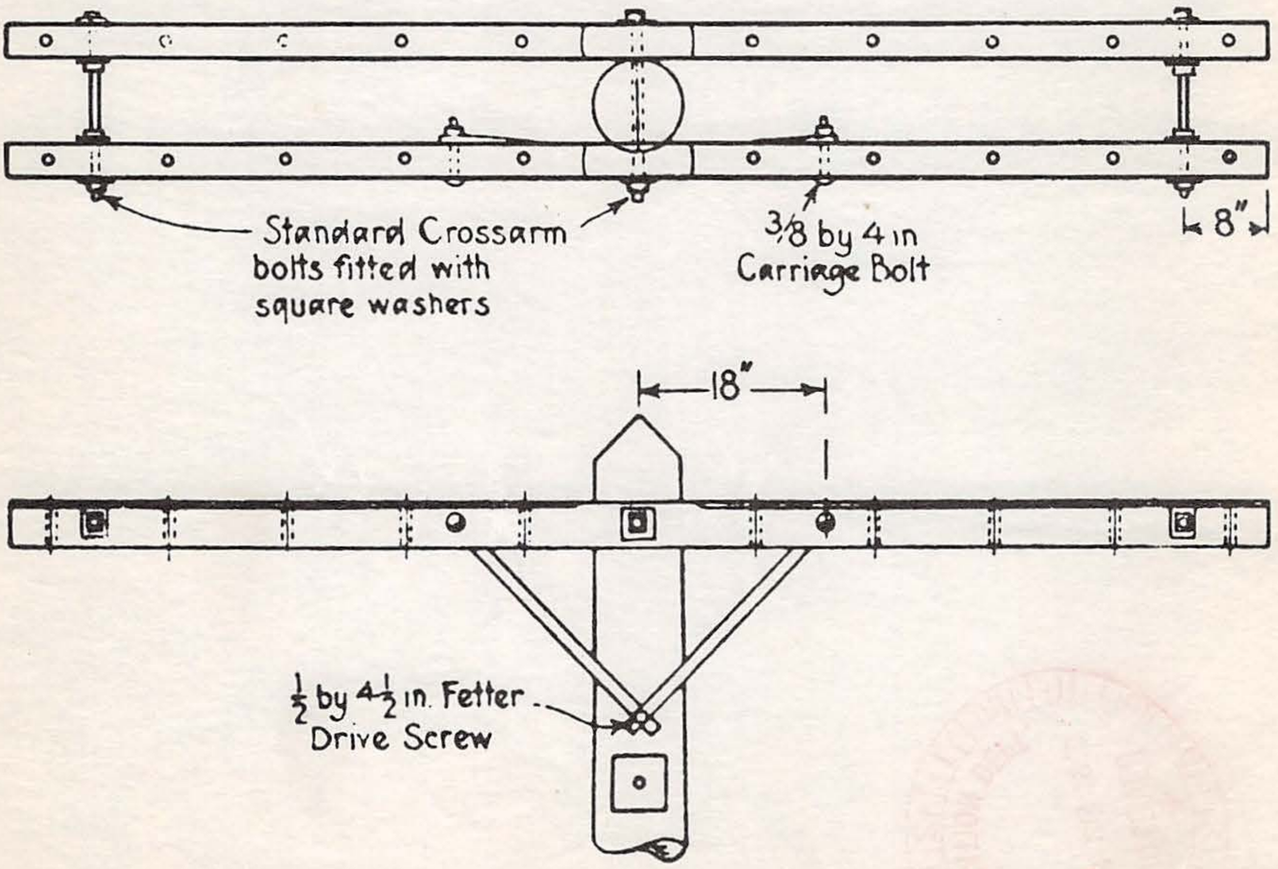
SPECIFICATION DEPT.
RECEIVED
FEB 23 1929
1 2 3 4 5 6 7 8 9 10 11 12


Square Washer
$\frac{3}{8}$ by 4 in. Carriage Bolt
Square Washer
18"
$\frac{1}{2}$ by $4\frac{1}{2}$ in. Fetter Drive Screw

Method of Attaching Single Crossarm

T & T 2631

January, 1939


Standard Crossarm bolts fitted with square washers
3/8 by 4 in Carriage Bolt
8"
18"
$\frac{1}{2}$ by $4\frac{1}{2}$ in. Fetter Drive Screw

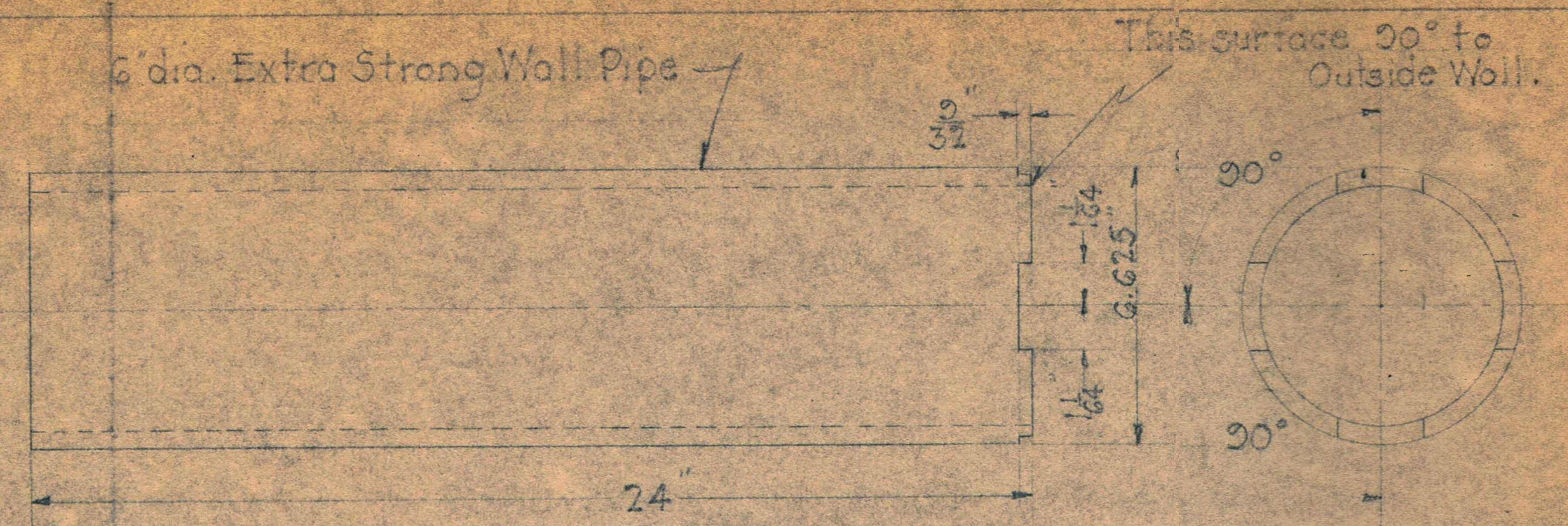
Method of Attaching Double Crossarms

T & T 2632

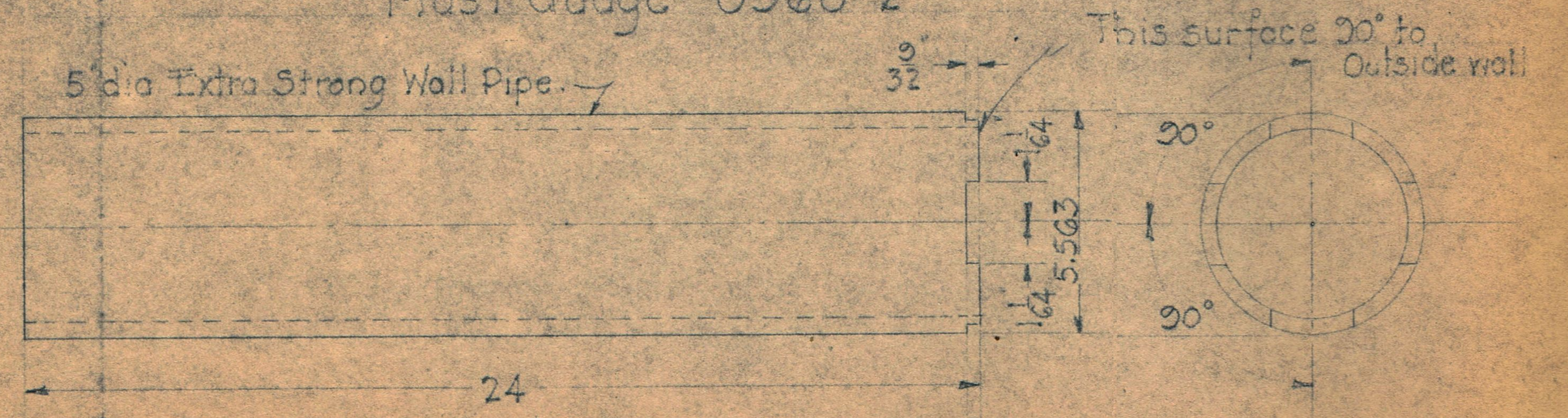
January, 1939

S-533

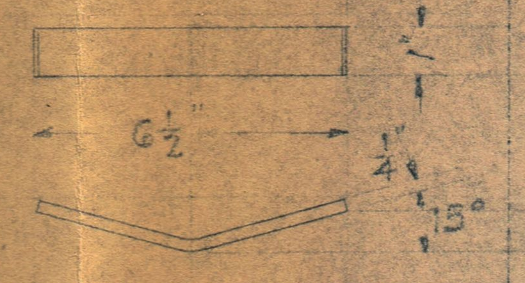
RECEIVED
FEB 28 1940
SPECIFICATION DEPT.


6" dia. Extra Strong Wall Pipe
This surface 90° to Outside Wall.
9/32"
1/64
6.625"
1/64
90°
90°
24"

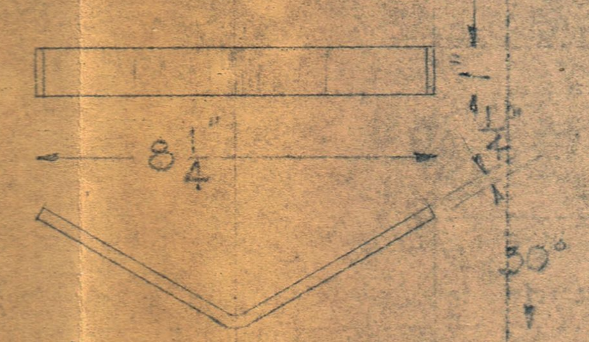
Mast Gauge - 0960-2


5" dia Extra Strong Wall Pipe.
This surface 90° to Outside wall
9/32"
1/64
5.563
1/64
90°
90°
24

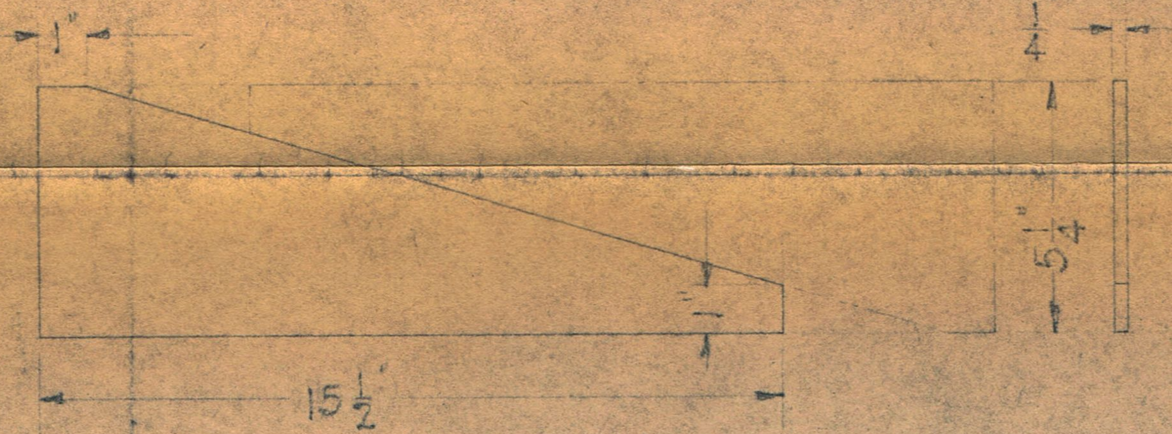
Mast Gauge - 0961-2



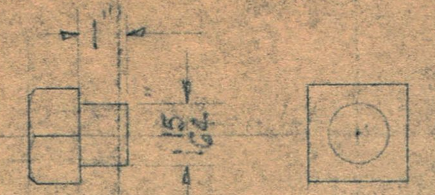
Web Support - 0960-5
(4 Req'd.)



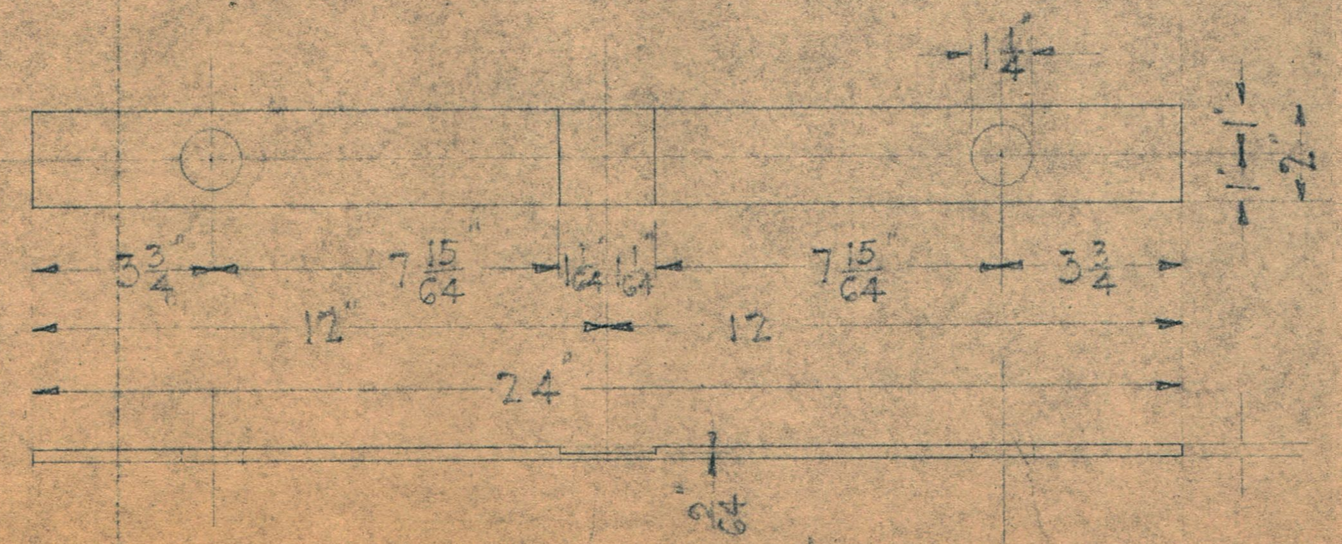
Web Support - 0961-5
(4 Req'd.)


1"
1/4"
5 1/4"
1"
15 1/2"

Web Guide - 0960-3
(8 - Req'd.)



Guide Pin - 0960-4
(Make from 1¼ dia. Mach. Bolt.)
4 - Req'd.


1 1/4"
1"
2"
3 3/4"
7 15/64"
1/64"
1/64"
7 15/64"
3 3/4
12"
12
24"
9/64"

Gauge Foot - 0960-4
(2 - Req'd.)

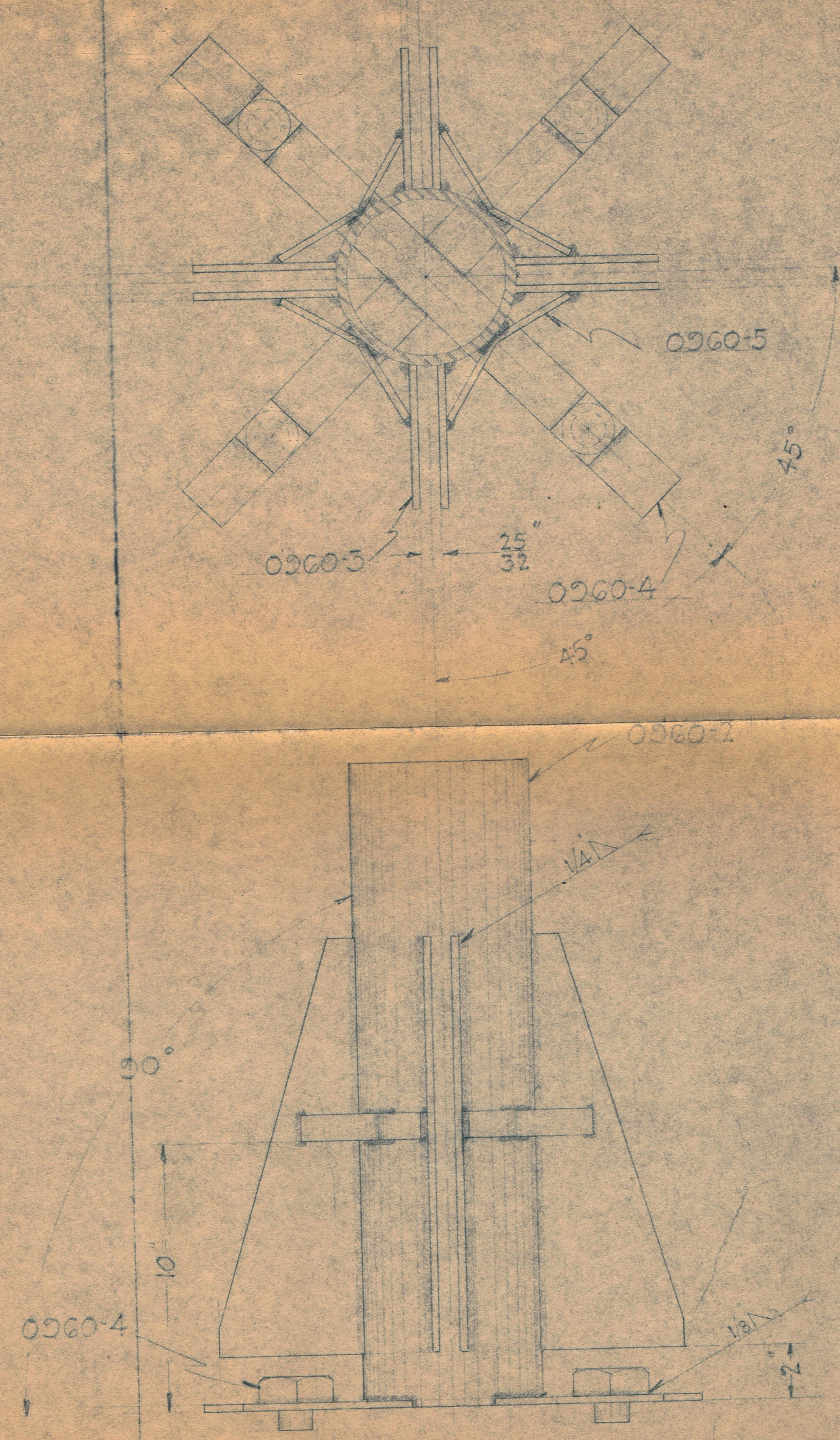
BALTIMORE & OHIO RAILROAD

WELDED STEEL BASE FOR
5 & 6-INCH SIGNAL MASTS

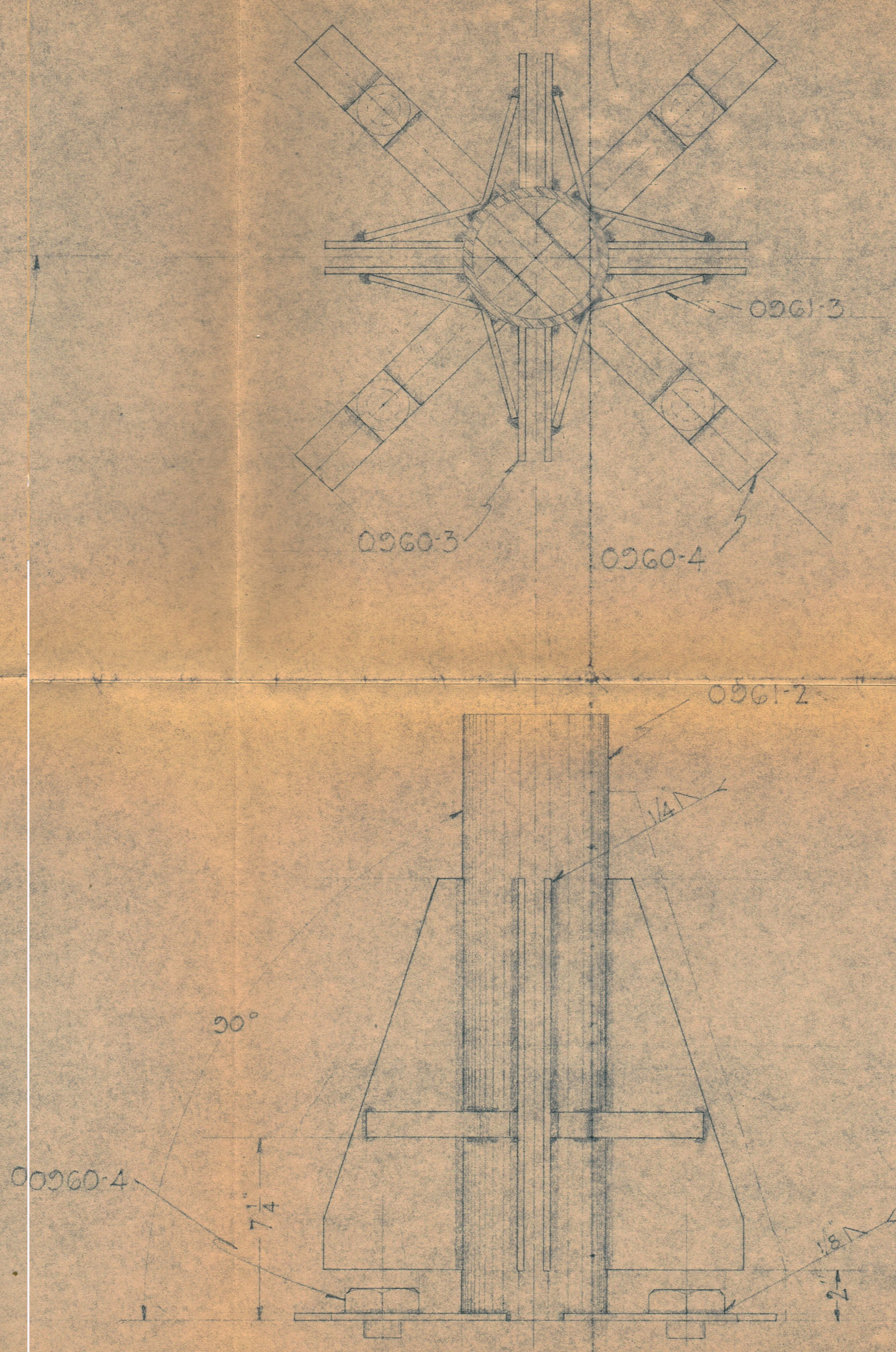
Office of Signal Engineer
Baltimore, Md.
July 13, 1960

Sheet No. 1B

S-96-B


0960-5
0960-3
25/32"
0960-4
45°
45°
0960-2
1/4
90°
10"
0960-4
1/8
2"

WELDING JIG FOR 6" DIA. PIPE BASE
No.-0960-1


0961-3
0960-3
0960-4
0961-2
1/4
90°
0960-4
7 1/4"
1/8
2"

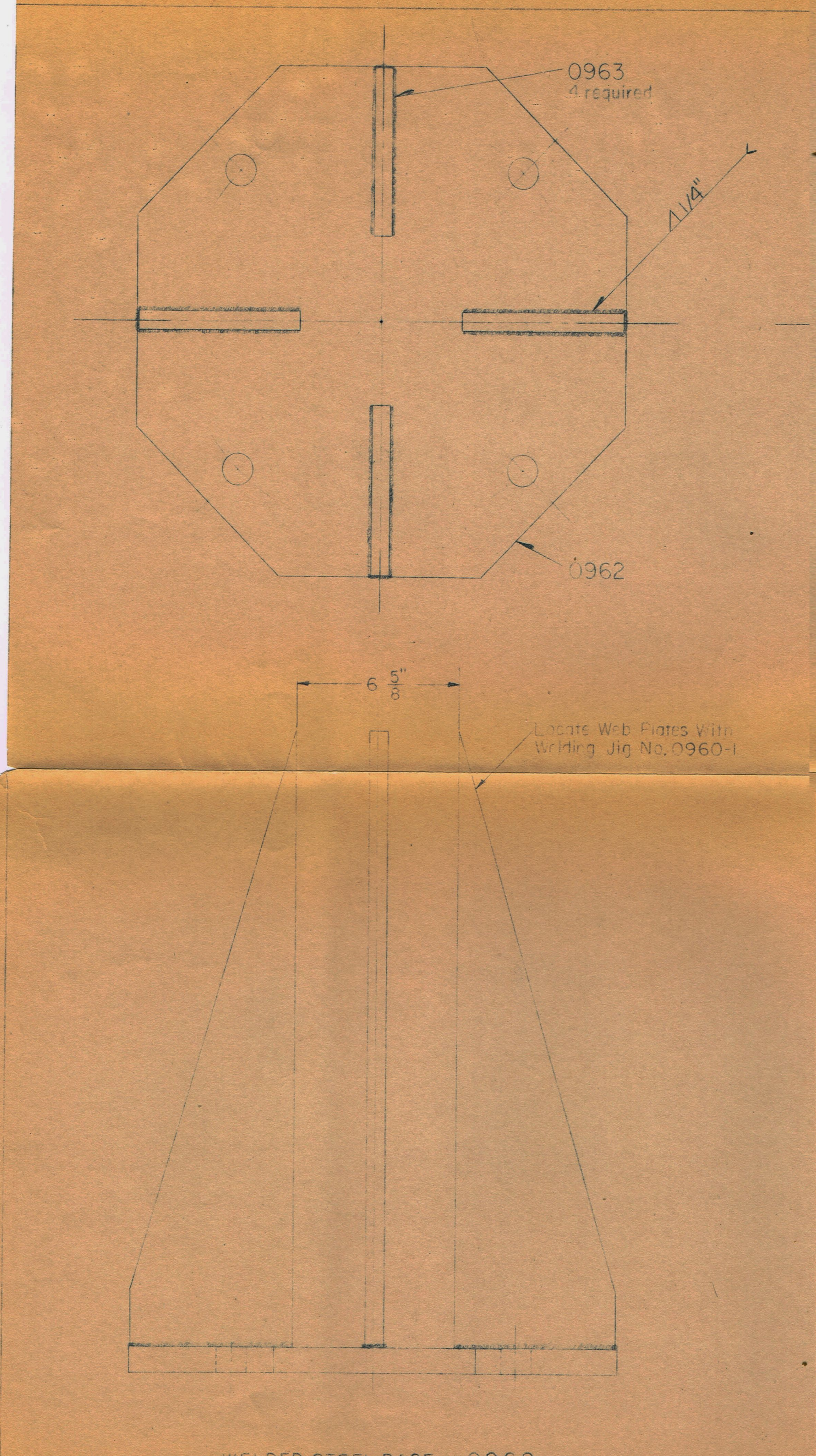
WELDING JIG FOR 5" DIA. PIPE BASE
No.-0961-1

Note:
All welds to be 1/4" fillet unless noted.

BALTIMORE & OHIO RAILROAD
WELDED STEEL BASE FOR
5 & 6-INCH SIGNAL MASTS
Office of Signal Engineer
Baltimore, Md.
July 13, 1960

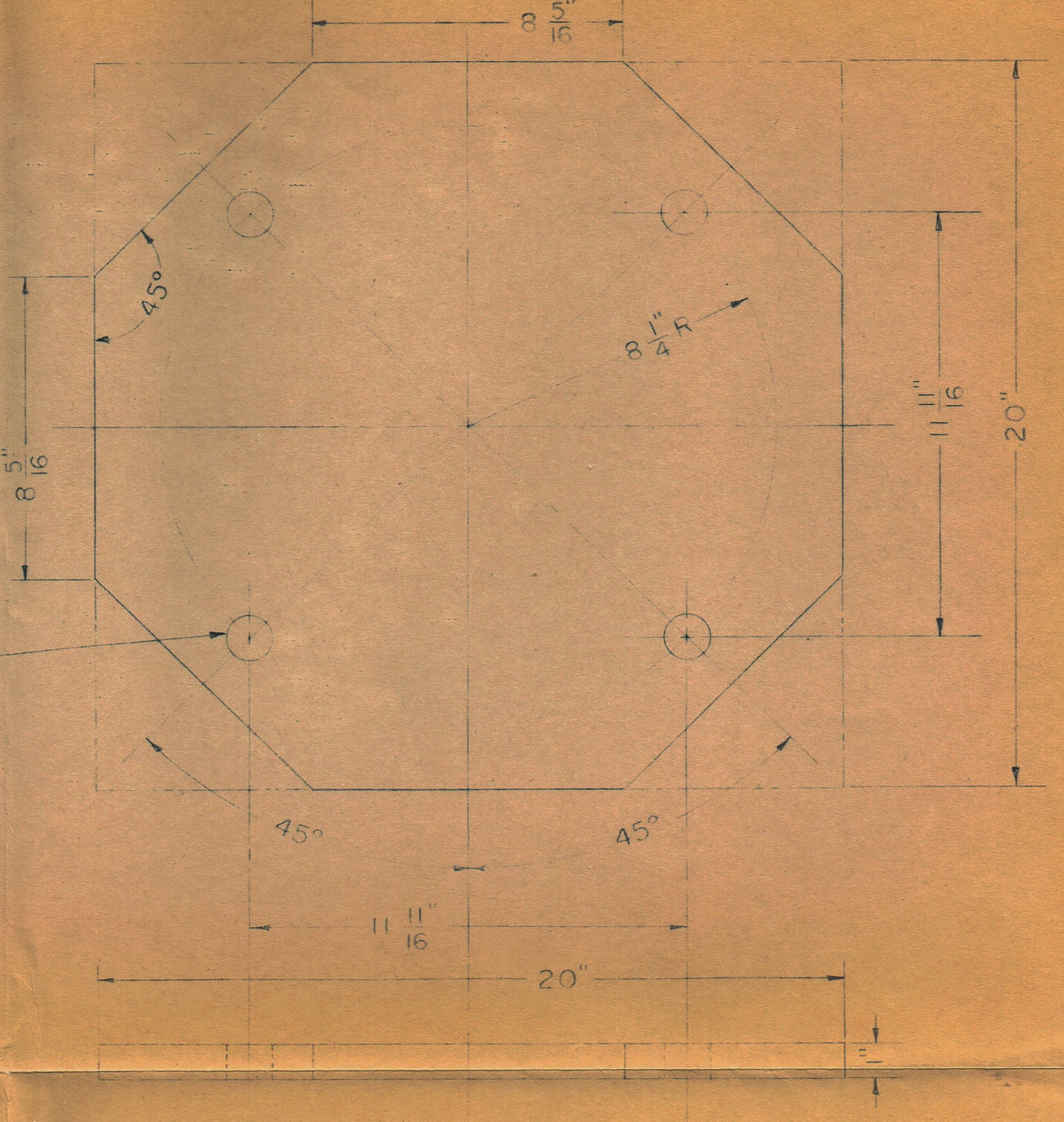
Sheet No. 1A

S-96-B


0963
4 required
△1/4"
0962
6 5/8"
Locate Web Plates With
Welding Jig No. 0960-1

WELDED STEEL BASE - 0960

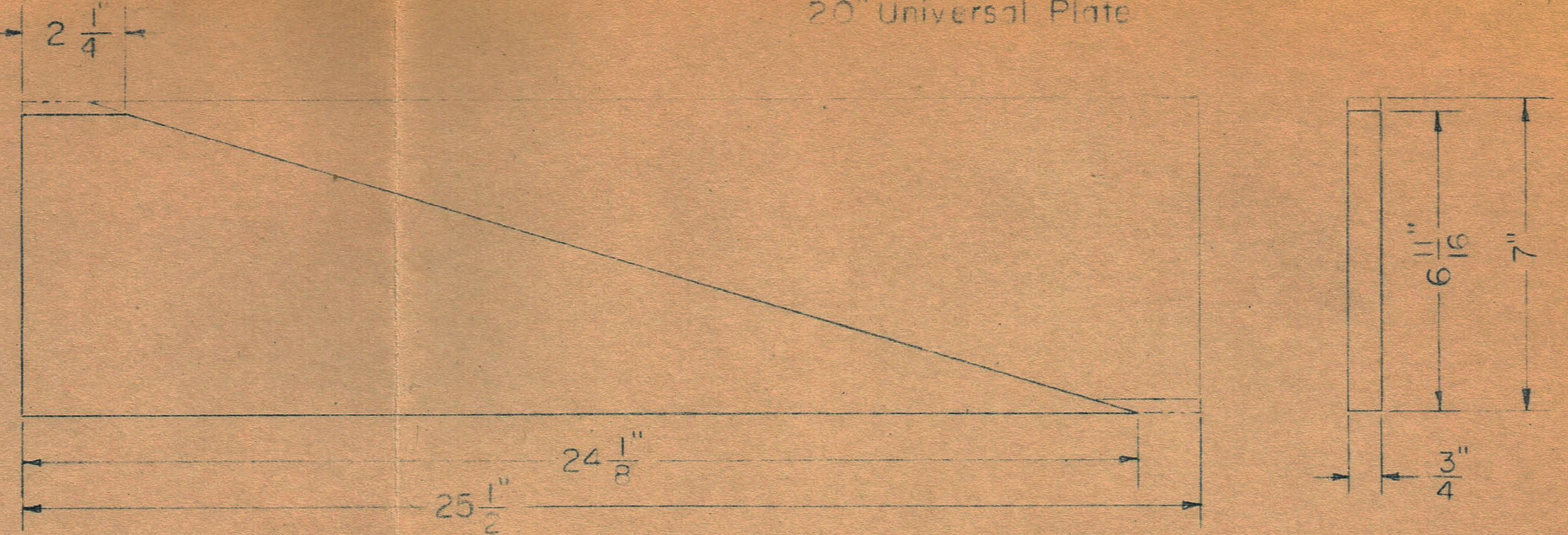
(for 6" dia. Steel Pipe)


8 5/16"
45°
8 1/4" R
8 5/16"
11 11/16"
20"
Punch 1-1/4" Dia.
4 Holes
45°
45°
11 11/16"
20"
1"

BASE PLATE — 0962

C-1020 Steel

20" Universal Plate


2 1/4"
24 1/8"
25 1/2"
6 11/16"
7"
3/4"

WEB PLATE — 0963

C-1020 Steel

7" Universal Plate

Approved: ______________________

Signal Engineer

BALTIMORE & OHIO RAILROAD

WELDED STEEL BASE FOR
5 & 6 INCH SIGNAL MASTS

Office of Signal Engineer
Baltimore, Md.
Mar. 27, 1963

NOTES:

All welding to be 1/4" fillet.

3-27-63: Base Plate redesigned.
5-10-63: 1-1/4" Dia. Hole Shown.

W.J.G.

Sheet No. 1

S-96-D

Jacksonville, Fl.
September 9, 1994

SA19948

TO: All Signal Employees

FROM: D. G. Orr, Chief Engineer - Train Control

SUBJECT: Safety Alert SA19948: Signal Cantilever Hook Bolts.

Signal ladders are attached to cantilevers with a hook bolt approximately six inches long that is threaded on the straight end. These bolts are illustrated on Signal Standard SS102 sheet #1. Some of the older hook bolts, especially on the former C&O and B&O properties, were made with the hook so tight that it appears to form a "V" in the curve portion. This tight curve forms a stress concentration that promotes corrosion and cracks in the hook bolt that may cause the bolt to fail. This could cause the ladder on the cantilever to become lose and possibly fall while being climbed.

Examine the ladder of all cantilevers before climbing to determine if the old style hook bolt, with the tight hook, is present. If the older style hook bolt is present, visually examine each one for cracks or excess corrosion. Do not climb a ladder unless all bolts are determined to be in good shape. Any broken or excessively corroded bolts should be replaced before climbing the ladder. Replacement bolts are shown in the Signal Standard SS106 sheet #2. If replacement bolts can not be installed immediately, red tag the ladder to identify the ladder as an unsafe condition. Notify the Signal Supervisor of this condition so that repairs can be initiated.

Each cantilever should be inspected in the course of normal business to determine how many of the tightly hooked bolts need to replaced immediately to insure the ladders can be climbed safely. Any tightly hooked bolts that do not require immediate replacement should be programmed for replacement during regular maintenance to prevent possible future hook bolt failure.